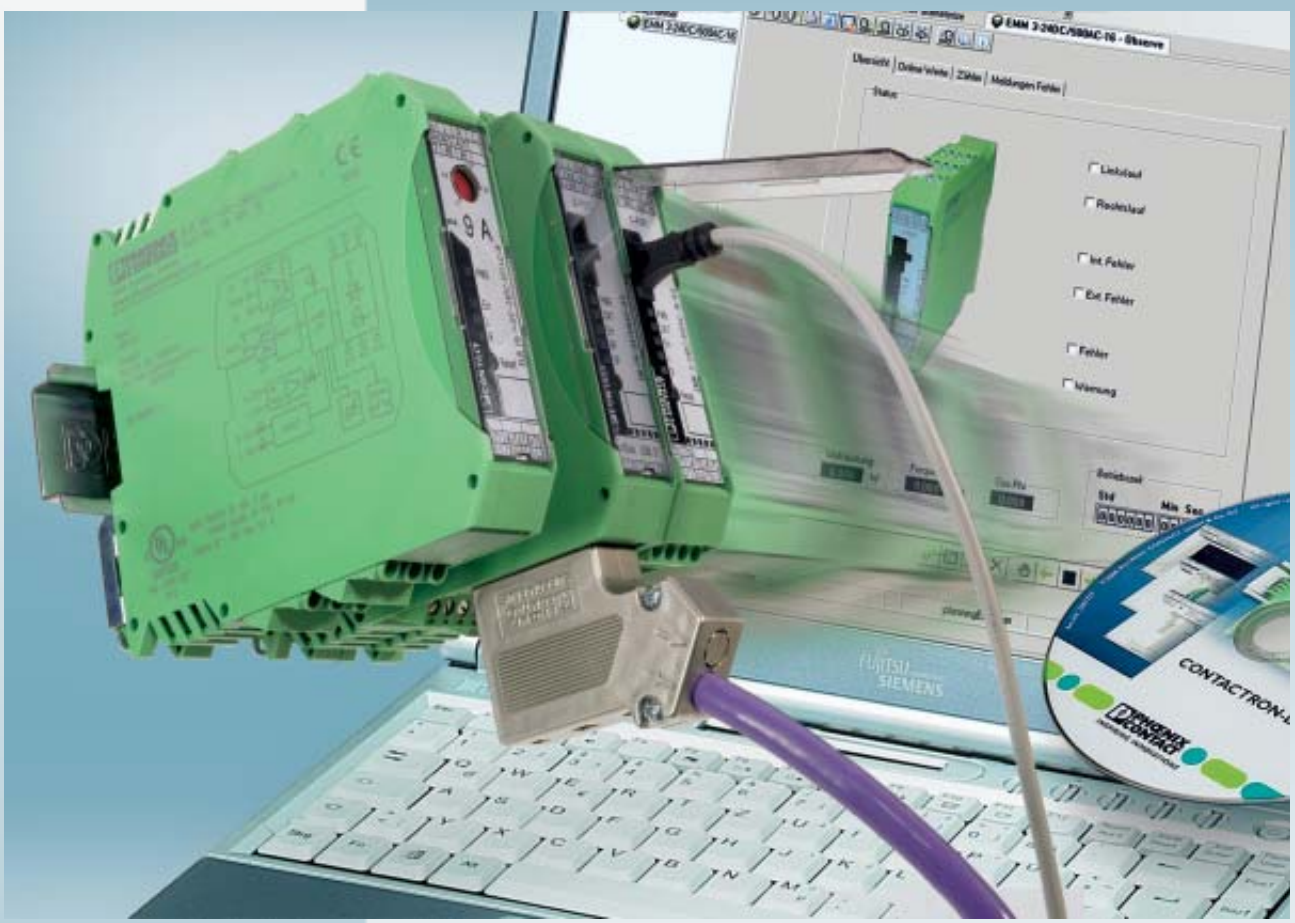

User manual

UM EN CONTACTRON

Motor Management

PHOENIX CONTACT
INSPIRING INNOVATIONS

User manual
Motor Management

2012-09-14

Designation: UM EN CONTACTRON

Revision: 01

Order No.: —

This user manual is valid for:

Designation	Order No.
EMM 3- 24DC/500AC-IFS	2297497
EMM 3-230AC/500AC-IFS	2297507
EMM 3- 24DC/500AC-16-IFS	2297523
EMM 3-230AC/500AC-16-IFS	2297536
EM-PB-GATEWAY-IFS	2297620
IFS-USB-PROG-ADAPTER	2811271
IFS-CONFSTICK-L	2901103
IFS-CONFSTICK	2986122
UT 4-MTD-R/CVC 690/SET	2901667
CONTACTRON-DTM-IFS	2297727

Please observe the following notes

User group of this manual

The use of products described in this manual is oriented exclusively to qualified electricians or persons instructed by them, who are familiar with applicable standards and other regulations regarding electrical engineering and, in particular, the relevant safety concepts.

Explanation of symbols used and signal words

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety measures that follow this symbol to avoid possible injury or death.

There are three different categories of personal injury that are indicated with a signal word.

DANGER This indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING This indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION This indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

This symbol together with the signal word **NOTE** and the accompanying text alert the reader to a situation which may cause damage or malfunction to the device, hardware/software, or surrounding property.

This symbol and the accompanying text provide the reader with additional information or refer to detailed sources of information.

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1 Introduction

1.1 Product overview

Electronic motor management modules (EMMs) (for order numbers, see "Technical data" on page 2-10) offer all the advantages of modern real power monitoring. Every 6.6 ms, the real power consumed of a drive system or another 3-phase load is determined based on three currents, voltages, and the phase angle.

EMM 3-.../500AC-16-IFS modules can measure currents of up to 16 A via integrated converters. EMM 3-.../500AC-IFS modules require additional external converters.

The actual switching of the load is performed by a separate switching element. The EMM is designed to reliably protect connected loads - irrespective of their rated power - against overload and underload, and to provide continuous status monitoring.

Freely parameterizable switching and signaling thresholds, plus four configurable digital outputs enable not only motor protection, but also protection for units or mechanical elements connected downstream, in particular.

All the relevant values are available via configuration software or a fieldbus interface: apparent, real, and reactive power, currents and voltages, phase angle, operating cycle and operating hours counters, power meter.

The EMM modules can monitor up to eight measured values simultaneously and control the four digital outputs according to the parameterization.

Power within limits

Monitoring is by means of freely parameterizable switching and signaling thresholds for overload and underload detection. By default, the thresholds are the same for both directions of rotation or are set separately for right/left rotation.

The value used as the basis for parameterization is the consumed real power, which is independent of voltage fluctuations and the drive machine load, and therefore much more precise than merely taking the current into consideration. If a threshold is violated, the EMM initiates an emergency shutdown of the motor immediately (or with an adjustable "delay time"). In addition, a message, e.g., to a higher-level control system, is sent via an output.

This state can only be deactivated via a defined reset. If the real power consumed is determined to be above or below the signaling threshold, only one confirmation is sent during the period that the module is activated.

In addition, the module generates signals to detect the direction of rotation. Phase failures are detected and signaled.

Continuous status monitoring with high scanning rates enables complete system protection, including motor protection.

The right rotation, left rotation, reverse, and limit switch operation (with integrated restart inhibit) modes switch actuating and regulating drives, pumps, tools, conveyor belts or similar, and monitor function, contamination or wear. The adjustable "inrush suppression" time can be used to mask out the switching operation from the monitoring process.

Machine tools are monitored and protected in a similar way when drilling, milling or grinding. If the feed value set on a milling machine is too high, the worst-case scenario is that a tool may break. The performance threshold parameterized accordingly remedies this matter. A signaling threshold also signals tool wear in advance.

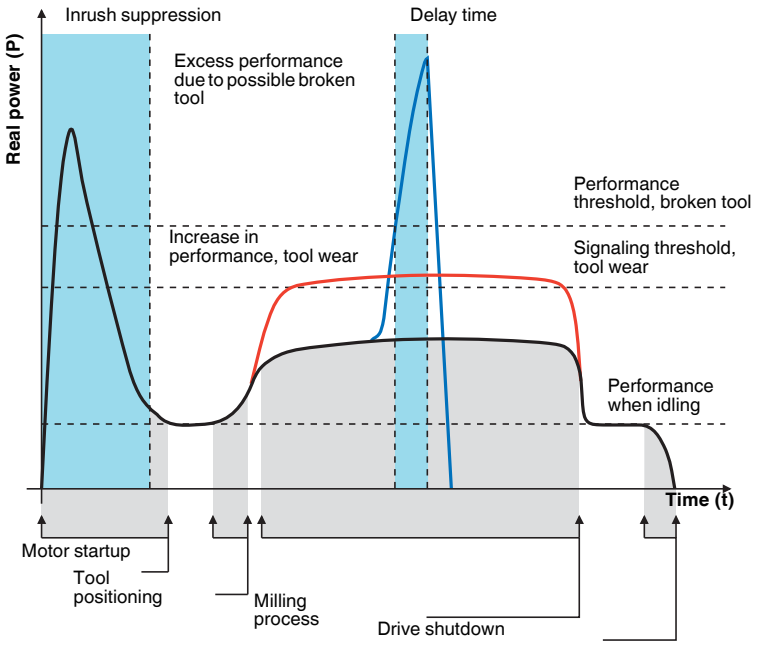


Figure 1-1 Example for broken tool

In the case of motor-driven pumps, the lower performance threshold provides reliable protection against hazardous dry running. Forced shutdown of the drive can be delayed by the "delay time". This prevents a response to any air bubbles that may be present in the system. Fans are monitored for broken V-belts in the same way.

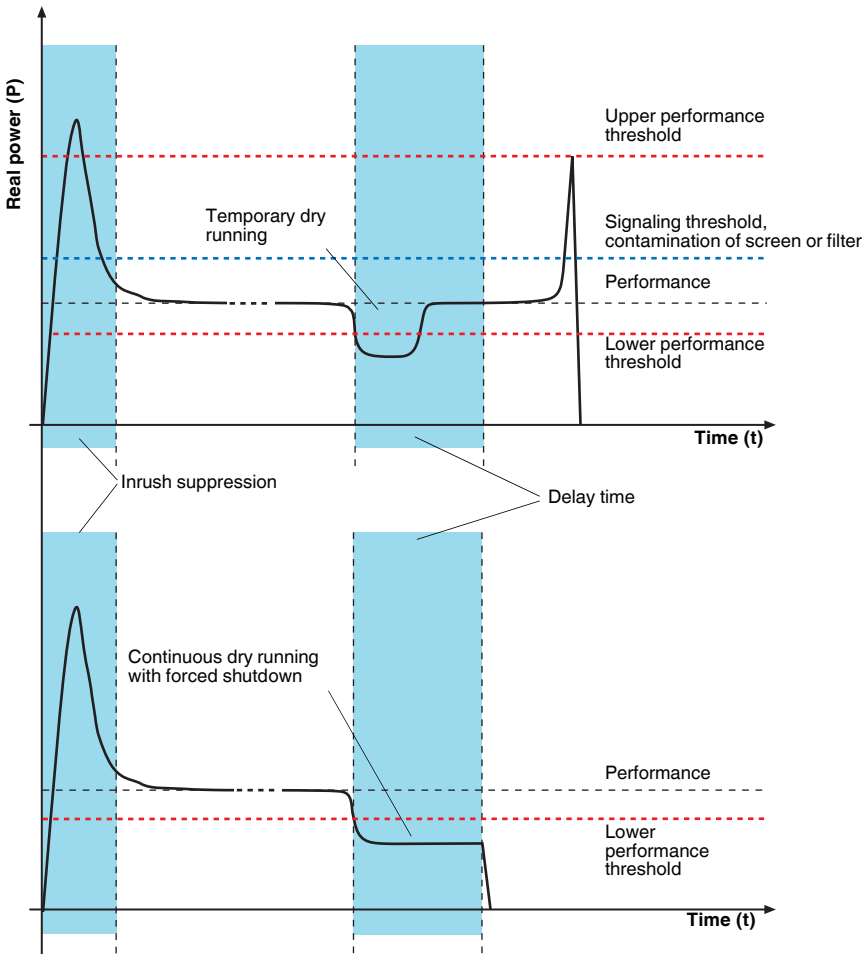


Figure 1-2 Example for dry running

1.2 About this user manual

This manual contains comprehensive information about the electronic CONTACTRON motor management modules and devices that are required in order to successfully use the modules. Detailed descriptions are provided for the following topics:

Content	Section
Function and handling of the electronic motor management modules	"EMM 3-.../500AC...-IFS electronic motor management module" on page 2-1
Handling of the memory block for easy storage and backup of configuration data	"IFS-CONFSTICK-L memory block" on page 3-1
Function and handling of the PROFIBUS module	"EM-PB-GATEWAY-IFS PROFIBUS module" on page 4-1
Installation of the modules on a DIN rail	"TBUS DIN rail connector" on page 5-1
Selection of a suitable current transformer for the electronic motor management modules	"Current transformer selection guide" on page 6-1
Description of the software for parameterizing the electronic motor management modules	"CONTACTRON-DTM-IFS device drivers" on page 7-1
Application examples for the products described here	"Application examples" on page 8-1

2 EMM 3-.../500AC...-IFS electronic motor management module

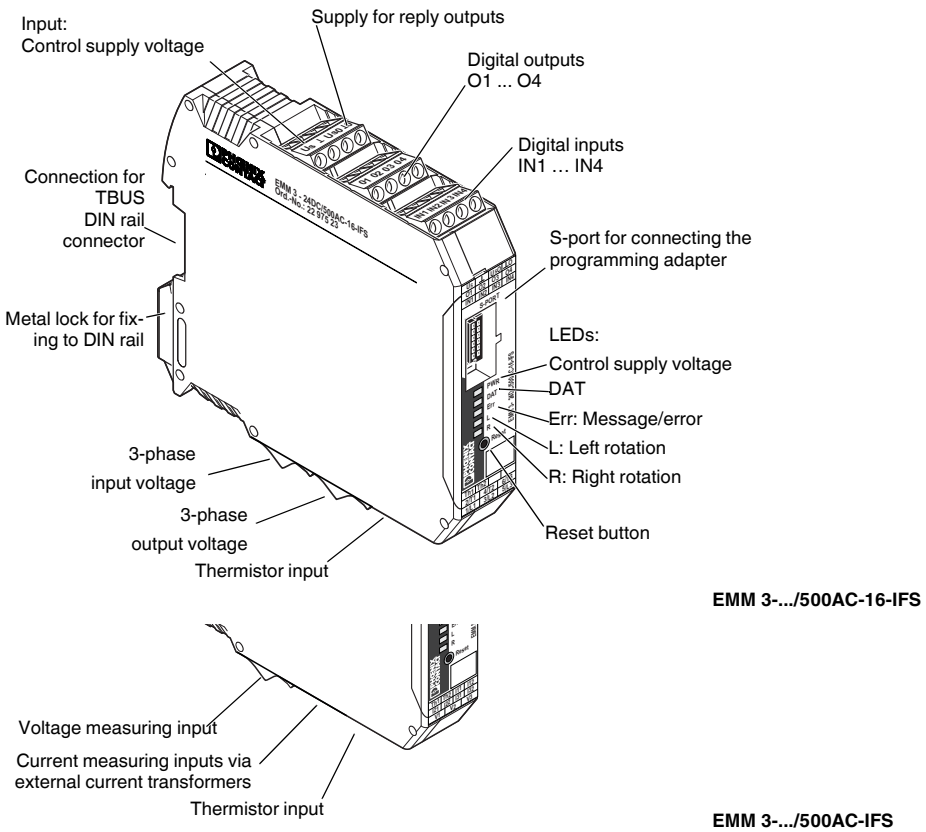


Figure 2-1 EMM 3-.../500AC...-IFS

2.1 Safety regulations/installation notes

WARNING: Risk of injury

During operation, parts of electrical switching devices carry hazardous voltages.

Before working on the device, disconnect the power.

Disregarding these safety regulations may result in death, serious personal injury or damage to equipment.

When working on the device, observe the national safety and accident prevention regulations.

Startup, assembly, modifications, and upgrades may only be carried out by a skilled electrical engineer.

Installation should be carried out following the instructions provided in the operating instructions. The circuits inside the device must not be accessed.

Protective covers must not be removed.

When using devices with 230 V AC control, always use the same phase for the rated control supply voltage and the control inputs.

NOTE: Possible damage to the device

The device is an associated item of equipment and must not be installed in potentially explosive areas. When installing and operating associated equipment, the applicable safety directives must be observed.

The device must not be subject to mechanical strain or thermal loads which exceed the limits described in the operating instructions. In order to provide protection against mechanical or electrical damage, install the device in appropriate housing with a suitable degree of protection according to IEC 60529/EN 60529. Where dust is present, the device must be installed in suitable housing (IP64 minimum) according to EN 61241.

The operating equipment cannot be repaired by the user and must be replaced by an equivalent device. Repairs may only be carried out by the manufacturer.

Keep the instruction sheet in a safe place.

The device carries out diagnostics on the functions when the drive is switched on or when it is switched off. In addition, a skilled electrical engineer or another skilled worker who is familiar with the relevant standards can carry out the "motor protection" safety function test. For this test, the drive must be operated with right or left rotation and the current flow in a conductor must be interrupted (e.g., by removing a fuse in phase L1 or L3). The EMM then shuts down within a period of 1.5 ... 2 s depending on the parameterization of the digital outputs. The LEDs for right or left rotation go out and the ERR LED flashes. When thermistor monitoring is used, this function can be checked by interrupting the thermistor cable once and short circuiting it once.

Scope of use

– The EMM 3-230AC... is a product designed for environment A (industrial applications).
  In environment B (domestic applications), this device can cause undesirable radio interference; in such a case, the user may be required to implement appropriate measures.
– The EMM 3- 24DC... can also be used in environment B (domestic applications).

2.2 Connection notes

2.2.1 Startup

A brand new device must be parameterized prior to startup. Otherwise operation is not possible.

In order to prevent parameters from being changed during operation, the software can only be used when the device is not activated.

Table 2-1 Requirements

Product	Order No.
CONTACTRON-DTM-IFS software for device parameterization of the electronic motor management modules (EMMs) See "CONTACTRON-DTM-IFS device drivers" on page 7-1	2297727
IFS-USB-PROG-ADAPTER programming adapter for configuring Phoenix Contact INTERFACE system modules with 12-pos. S-port interface See "Connecting the programming adapter" on page 7-4	2811271
IFS-CONFSTICK or IFS-CONFSTICK-L for easy storage and backup of configuration data See "IFS-CONFSTICK-L memory block" on page 3-1	2986122 2901103

2.2.2 Mains connection and line protection

WARNING: Risk of electric shock
Never carry out work when voltage is present.

When connecting the 3-phase network, you must observe the terminal designation.

Fuse protection: 25 A (Diazed) - line protection for maximum cable cross section of 2.5 mm^2

The control supply voltage inputs and control voltage inputs must be operated with power supply modules according to DIN 19240 (maximum residual ripple of 5%).

NOTE: Observe air and creepage distances
When using devices with 230 V AC control, always use the same phase for the control supply voltage and the control inputs.

In order to avoid inductive or capacitive coupling of disturbing pulses where long control lines are used, we recommend using shielded cables.

NOTE: Electrical safety
Only connect conductors with the same conductor cross section to a terminal point.

If you wish to monitor a 690 V network with EMM 3-.../500AC-IFS devices, the UT 4-MTDR/CVC 690/SET voltage transducer (Order No. 2901667) must be used.

2.2.3 Thermistor input

In order to protect the motor against overheating, 1 to 6 PTC thermistors can be connected in series via terminal points "Th1" and "Th2".

Cable lengths between EMM and thermistor in [m]	35	70	100	140	210	355
Conductor cross section in [mm^2]	0.25	0.5	0.75	1	1.5	2.5

2.2.4 Block diagram

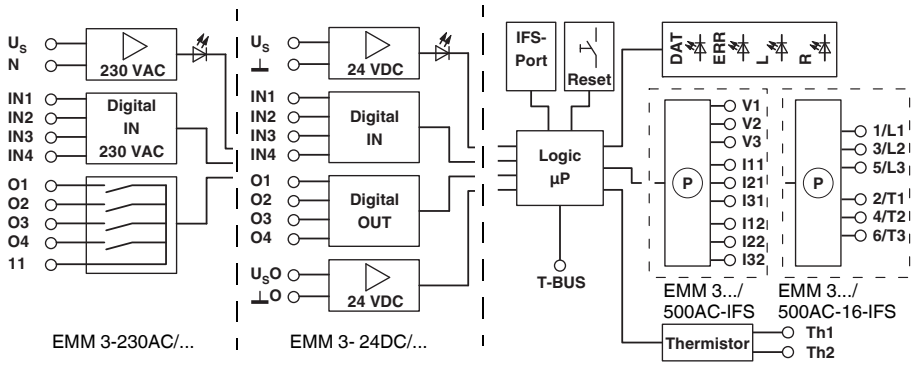


Figure 2-2 Block diagram

2.2.5 TBUS DIN rail connector

The TBUS DIN rail connector can only be used to supply the modules if 24 V DC devices are used.

The EMM 3-.../500AC...-IFS modules can be mounted on a DIN rail. For detailed information about mounting/removal, please refer to "TBUS DIN rail connector" on page 5-1.

2.2.6 Connection versions

2.2.6.1 Separate switching element

Depending on the requirements of the application, either an electromechanical contactor or reversing contactor combination, or an electronic load relay or reversing load relay should be used to switch the load.

To control these switching elements, the EMM supplies four digital outputs:

EMM 3- 24DC/...	Semiconductor outputs with 24 V DC/500 mA
EMM 3-230AC/...	Floating relay outputs with 230 V AC/DC/500 mA For inductive loads, use a suitable contact protection circuit.

2.2.6.2 Line currents up to 16 A

For line currents up to 16 A, EMM 3-.../500AC-16-IFS modules are suitable thanks to their integrated current transformers up to 16 A.

The external switching element is controlled directly via the EMM.

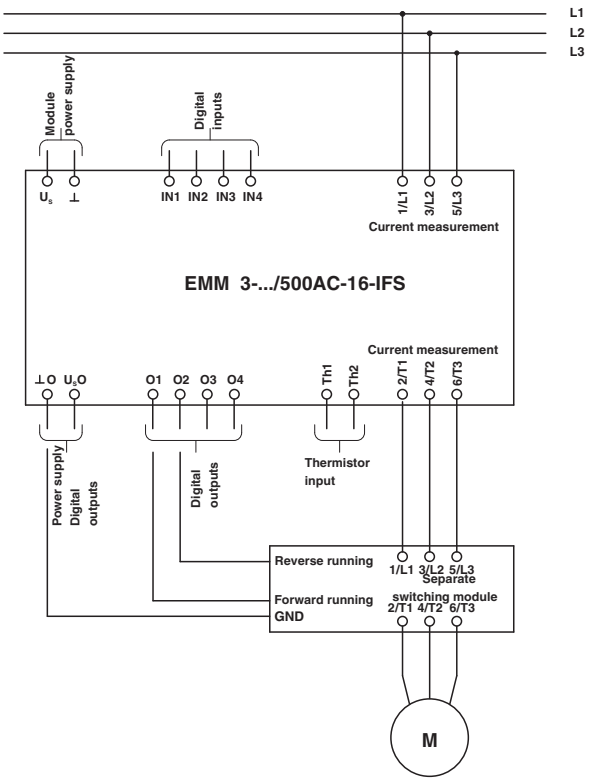


Figure 2-3 EMM 3-.../500AC-16-IFS for line currents up to 16 A

2.2.6.3 Line currents > 16 A - External current transformers

For currents > 16 A, use EMM 3-.../500AC-IFS modules. These require additional external current transformers.

Appropriate PACT Analog current transformers can be found in the Phoenix Contact INTERFACE catalog. The basic insulation requirements are met by PACT current transformers. A selection guide can be found in 6 on page 6-1.

WARNING: Risk of electric shock
Current transformers and the measuring instruments to be connected to them must only be installed when the system power is switched off.

During wiring, observe the order in which the current transformers are connected (direction of current flow).

Primary circuit: K-P1 → L-P2; secondary circuit: k-S1 → l-S2

WARNING: Risk of electric shock
When the current transformer is operated with an open secondary circuit, hazardous voltages may occur at the secondary terminal blocks.

Table 2-2 Recommended transformer data

Requirement	Value
Surge withstand capability	6 kV
Primary voltage	1000 V
Surge voltage category	III
Standard	EN 50178, IEC 60044-1
Transformer type	Linear measuring transducer
Temperature range	-25°C ... +70°C
Transformation ratio	$TR = \frac{I_{pn}}{I_{sn}}$
Primary rated current I_{pn}	Application-specific
Secondary rated current I_{sn}	5 A
EMM internal resistance	0.02 Ω
Sum of system errors	EMM errors + Transformer errors
Transformer class	1

Maximum cable length [m] between EMM and external current transformer (depending on the rated power S_n of the current transformer and the conductor cross section used):

Conductor cross section	Rated power S_n [VA]											
	1.25	1.5	2	2.5	3.75	5	7.5	10	15	20	30	45
0.75 mm^2	0.5	0.6	1.0	1.4	2.2	3.0	4.7	6.5	9.8	13.3	20.0	30.4
1 mm^2	0.6	0.9	1.4	1.8	3.0	4.1	6.3	8.6	13.2	17.8	26.9	40.6
1.5 mm^2	1.0	1.4	2.0	2.7	4.4	6.1	9.5	13.0	19.8	26.6	40.3	60.8
2.5 mm^2	1.7	2.2	3.4	4.6	7.4	10.2	15.9	21.6	33.0	44.4	67.2	101.4

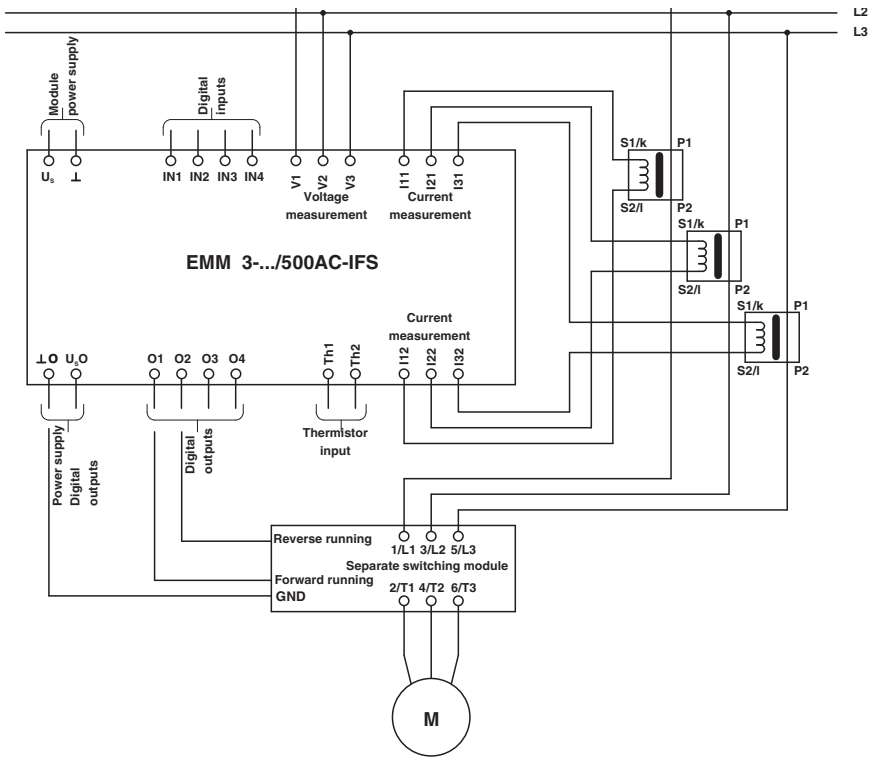


Figure 2-4 EMM 3-.../500AC-IFS for currents > 16 A

2.3 Function

2.3.1 Status LEDs

The EMM visualizes the operating states using a total of five (5) LEDs. The functions of the LEDs are based on NAMUR recommendation NE 44.

When the rated control supply voltage is applied, all LEDs light up once as an LED test.

A green LED (PWR) indicates the general device status.

Left and right rotation of the drive is indicated by one yellow LED each (L/R).

An internal or external error (process error: overcurrent, asymmetry, phase failure) is indicated by a red LED (ERR). The device then enters the safe shutdown state. To exit this state (external error), error acknowledgment is required.

All internal errors cannot be acknowledged and are stored in the Flash memory.

LED					Cause
PWR	DAT	ERR	L	R	
A	x	x	x	x	No supply voltage (control supply voltage) present
E	x	x	x	x	Supply voltage (control supply voltage) present
E	x	A	E	A	Drive switched on: Left rotation (L)
E	x	A	A	E	Drive switched on: Right rotation (R)
E	x	A	B	B	A message is present.
E	E	x	x	x	Cyclic data traffic
E	x	E	x	x	Internal device error. Acknowledgment not possible. Module faulty.
E	x	B	A	A	External error in control or I/O. (Maintenance requirement, NE44, see "Error acknowledgment")
E	x	B	B	B	Error restoring the system state. The thermal memory of the bimetal function is set to the maximum value.
					Bimetal trigger. Cooling time running. Acknowledgment not possible.
E	x	B	E	A	- An error has occurred for left rotation
E	x	B	A	E	- An error has occurred for right rotation
					Bimetal trigger. Cooling time has elapsed. Acknowledgment possible.
E	x	B	E	B	- An error has occurred for left rotation
E	x	B	A	B	- An error has occurred for right rotation

A: OFF B: Flashing

E: ON x: OFF or ON

Error acknowledgment

There are various options available for error acknowledgment:

Type of acknowledgment	Description
Manual (reset button)	An acknowledgment is triggered by pressing the reset button on the front of the device. If the reset button is held down for more than approximately 2 seconds, the EMM will enter the error state again.
Manual (remote acknowledgment)	A remote acknowledgment operating point can be implemented by connecting a button (N/O contact) to IN 4. An acknowledgment is triggered as soon as a positive edge is detected at the input. If no negative edge is detected after approximately 2 seconds, the EMM enters the error state again since manipulation or a fault in the acknowledgment circuit may have occurred.
Manual (software)	An acknowledgment can be implemented by the operating software.
Automatic	For certain errors, an automatic acknowledgment can be parameterized.

Confirmation

All unused outputs of the EMM are available for confirmations. The behavior of the reply outputs is specified by the parameterization.

2.3.2 Parameterization

The CONTACTRON-DTM-IFS configuration software provided is required in order to parameterize and visualize the EMM (for detailed information, please refer to Section 7 on page 7-1). In addition, the IFS-USB-PROG-ADAPTER USB programming adapter (Order No. 2811271) is also required (for detailed information, please refer to Section 7.2 on page 7-4).

The configuration software is used to:

– Display and record operating data so that this can be further processed, e.g., in databases.
– Define switching output types, such as:
  Digital outputs without switching function, direct starters, reversing starters, star/delta starters, star/delta L/R.

The assignment of inputs IN1 to IN3 to functions (motor function or digital output) is fixed. The assignment of input IN4 for remote reset is fixed.

Table 2-3 Configuration, settings: Switching output, static inputs

Switching output type	Input/output	Description
Digital outputs	Inputs IN1 ... IN3	No function (logic operation on request)
	Input IN4	Reset
	Outputs O1 ... O4	Freely parameterizable
Direct starter	Input IN1	Start/stop
	Input IN2	No function (logic operation on request)
	Input IN3	On-site control
	Input IN4	Reset
	Output O1	Contactor start/stop
	Outputs O2 ... O4	Freely parameterizable
Reversing starter	Input IN1	Right rotation
	Input IN2	Left rotation
	Input IN3	On-site control
	Input IN4	Reset
	Output O1	Right contactor
	Output O2	Left contactor
	Outputs O3 ... O4	Freely parameterizable
Star/delta	Input IN1	Start/stop
	Input IN2	No function (logic operation on request)
	Input IN3	On-site control
	Input IN4	Reset
	Output O1	Mains contactor
	Output O2	Delta contactor
	Output O3	Star contactor

Table 2-3 Configuration, settings: Switching output, static inputs [...]

Switching output type	Input/output	Description
	Output O4	Freely parameterizable
Star/delta L/R	Input IN1	Right rotation
	Input IN2	Left rotation
	Input IN3	On-site control
	Input IN4	Reset
	Output O1	Mains contactor (right)
	Output O2	Mains contactor (left)
	Output O3	Delta contactor
	Output O4	Star contactor

2.4 Technical data

The technical data applies for the following products.

Product	Order No.
EMM 3- 24DC/500AC-IFS	2297497
EMM 3- 24DC/500AC-16-IFS	2297523
EMM 3-230AC/500AC-IFS	2297507
EMM 3-230AC/500AC-16-IFS	2297536

Input data	EMM 3- 24DC/...	EMM 3-230AC/...
Rated control supply voltage U_S according to IEC 60947-1	24 V DC	230 V AC
Control supply voltage range	19.2 ... 30 V DC	96 ... 253 V AC
Current consumption at U_S	≤ 33 mA	≤ 12 mA
Rated frequency	-	50 ... 60 Hz
Control inputs IN1 - IN4: Switching level "High" Switching level "Low" Input current Input circuit	 19.2 V DC 9.6 V DC 3.3 mA Serial diode for protection against polarity reversal	 96 V AC 48 V AC 3.5 mA -
Control supply voltage indicator	Green PWR LED	
Status indicator	Yellow L, R LED	
Data communication	Green DAT LED	
Error indicator	Red ERR LED	

	EMM 3- 24DC/...	EMM 3-230AC/...
Thermistor input	1 ... 6 thermistors in series (PTC) For ATEX applications: 3 ... 6 thermistors	
Total cold resistance	≤ 1.5 kΩ	
Operate value	≤ 3.72 kΩ	

	EMM 3- 24DC/...	EMM 3-230AC/...
Thermistor input	1 ... 6 thermistors in series (PTC) For ATEX applications: 3 ... 6 thermistors	
Release value	≤ 1.61 kΩ	
Wire break	≤ 60 kΩ	
Short circuit	≤ 20 Ω	

Reply output	EMM 3-24DC/...	EMM 3-230AC/...	
Confirmation O1 ... O4	Semiconductor (short-circuit-proof)	Relay (N/O contact)	
Contact type	-	4 x single contact	
Contact material	-	Ag alloy, hard gold-plated	
When used as	-	**Signal contact**	**Power contact**
Nominal output voltage U_{SO}	24 V DC	24 V AC/DC	230 V AC
Maximum switching voltage	30 V DC	30 V AC/36 V DC	250 V AC/DC
Minimum switching voltage	19.2 V DC	0.1 V AC/DC	12 V AC/DC
Surge voltage limitation U_O	> 33 V DC	-	-
Maximum continuous load current I_L per channel	500 mA	50 mA	500 mA
Minimum switching current	-	1 mA	10 mA
Maximum interrupting rating, ohmic load	-		
24 V DC	12 W	1.2 W	12 W
48 V DC	-	-	20 W
60 V DC	-	-	18 W
110 V DC	-	-	23 W
220 V DC	-	-	40 W
250 V AC	-	-	115 VA
Residual voltage at I_O	< 200 mV	-	-
Output circuit	Suppressor diode	-	-
Surge voltage limitation O1 ... O4	> 33 V DC	-	-

EMC regulations	EMM 3- 24DC/...	EMM 3-230AC/...
Noise immunity according to	EN 61000-6-2	EN 61000-6-2
Noise emission (environmental category) according to	EN 61000-6-3 (B)	EN 61000-6-3 (A)
Increased EMC requirements according to	EN 62061	EN 62061

Measuring system, electrical data	EMM .../500AC-IFS	EMM .../500AC-16-IFS
Rated operating voltage U_e according to IEC 60947-1	500 V AC	500 V AC
Operating voltage range	42 ... 575 V AC	42 ... 575 V AC
Input current for voltage measurement	< 0.5 mA	< 0.5 mA
Rated operating current I_e according to IEC 60947-1	5 A AC external transformer	16 A AC
Minimum operating current	140 mA	400 mA
Frequency range	40 ... 100 Hz	40 ... 100 Hz
Rated frequency according to IEC 60947-1	50 ... 60 Hz	50 ... 60 Hz
Output power of external transformer	≥ 1.25 VA	-
EMM internal resistance	0.02 Ω	-

Current measurement	EMM .../500AC-IFS	EMM .../500AC-16-IFS
Measurement via (TR = Transformation ratio of external current transformer)	External straight-through current transformer connected upstream	Internal current transformer
Measuring range	0.15 ... 6 A x TR	0.4 ... 60 A
Accuracy	0.5%, typical	0.5%, typical

Voltage measurement	EMM .../500AC-IFS	EMM .../500AC-16-IFS
Measuring range	30 V AC ... 350 V AC star voltage 50 V AC ... 600 V AC line voltage	
Accuracy	0.75%, typical	0.75%, typical

Power measurement	EMM .../500AC-IFS	EMM .../500AC-16-IFS
Accuracy	2%, typical	2%, typical

Motor protection	EMM .../500AC-IFS	EMM .../500AC-16-IFS
Parameterizable current range	0.3 ... 6 A (4000 A, maximum via external transformer)	1 ... 16 A up to Class 30 1 ... 14 A up to Class 40
Tripping time accuracy (t_{amb} = 20°C)	±20%	±20%

Symmetry monitoring	EMM .../500AC-IFS	EMM .../500AC-16-IFS
Amount $(I_{max} - I_{min})/I_{max}$	≥ 33%/≥ 67%	
Response time	2 min/1.8 s	
Amount (angle (L1, L3))	220° ... 260°	
Response time	1.8 s	

Data interface	EMM .../500AC-IFS	EMM .../500AC-16-IFS
Interface type	TBUS, S-PORT	

Ambient conditions	EMM .../500AC-IFS	EMM .../500AC-16-IFS
Ambient temperature t_{amb} (operation)	-25°C to +70°C (see derating curve)	
Ambient temperature t_{amb} (transport, storage)	-40°C to +80°C	

General data	EMM .../500AC-IFS	EMM .../500AC-16-IFS
Minimum/maximum power dissipation	1.5 W/2.5 W	2 W/5.5 W
Nominal operating mode	100% operating factor	
Degree of protection according to EN 60529 (VDE 0470 Part 1)	IP20	
Mounting position (observe derating)	Vertical (horizontal DIN rail)	
Mounting	Can be aligned without spacing	
Coordination type (EMM 3-.../500AC-16-IFS with 25 A Diazed)	2 (short-circuit-proof on 10 kA network)	
Power station requirement	DWR1300Zxx001/DD/70.80.8/830001:1985-08	
Low voltage switching devices	IEC 60947-4-2: 2007-09	

General data [...]	EMM .../500AC-IFS	EMM .../500AC-16-IFS
Air and creepage distances according to Between the circuits Thermistor input	IEC 60947-1: 2008-04 Safe isolation (input/output) Basic insulation (thermistor input/output)	
Thermistor tripping mechanism	IEC 60947-8: 2007-07, DIN 44081, DIN 44082	
Rated insulation voltage	500 V	
Impulse voltage withstand level	8 kV	
Surge voltage category	III	
Pollution degree	2	
FE connection	Via grounded DIN rail	
Housing material	PA 66	
Dimensions (width x height x depth)	22.5 mm x 99 mm x 114.5 mm	
Weight	180 g, approximately	

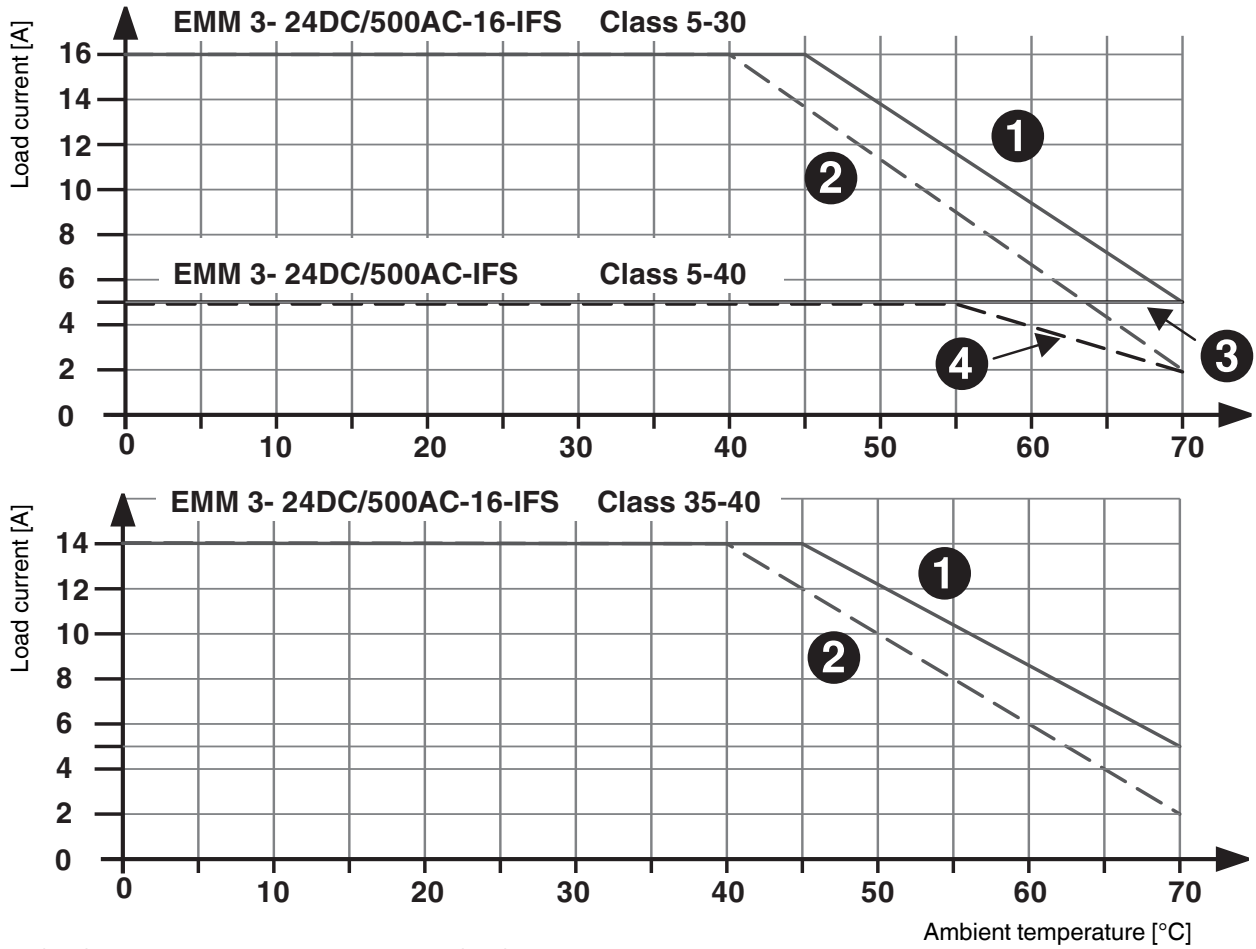
Approvals	EMM .../500AC-IFS	EMM .../500AC-16-IFS
EC-type examination certificates according to ATEX	 II (2) G,  II (2) D PTB 10 ATEX 3024	

Connection data	EMM .../500AC-IFS	EMM .../500AC-16-IFS
Screw terminal blocks (solid/stranded)	0.14 ... 2.5 mm^2	
M3 thread, recommended tightening torque	0.5 Nm ... 0.6 Nm	
AWG	26 - 14 AWG	

2.4.1 Derating curves

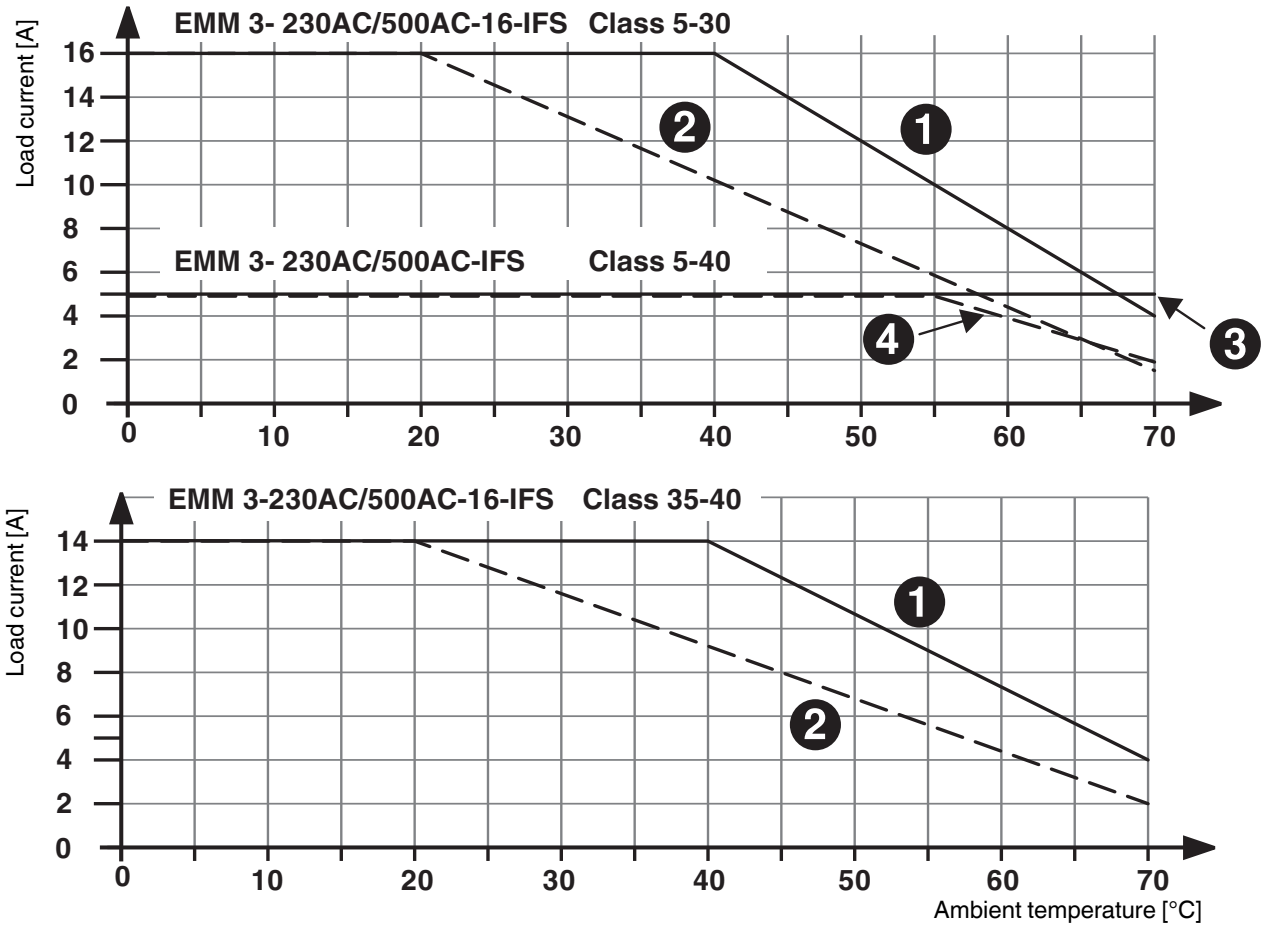
100% operating time; additional data available on request

Up to Class 30, the maximum inrush current for EMM-...16-IFS is 128 A, and for Class 35 and Class 40 it is 112 A.



❶ / ❸ ≙ Aligned with spacing of 20 mm ❷ / ❹ ≙ Aligned without spacing

Figure 2-5 Derating curves, EMM 3- 24DC/...



❶ / ❸ ≙ Aligned with spacing of 20 mm ❷ / ❹ ≙ Aligned without spacing

Figure 2-6 Derating curves, EMM 3-230AC/...

2.4.2 Trigger characteristics at 20°C

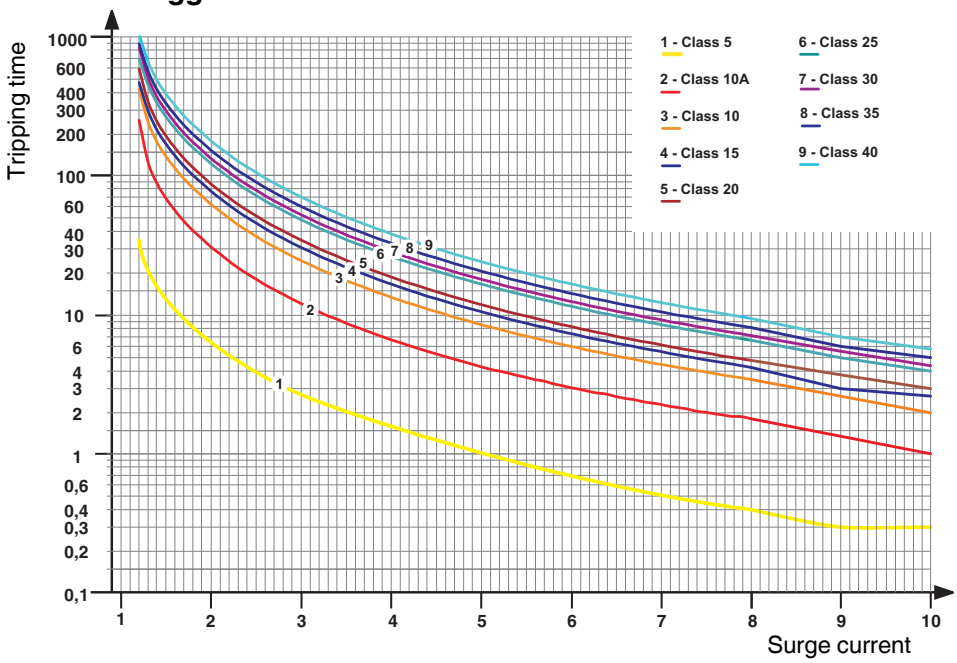


Figure 2-7 Trigger characteristic for 20°C (blocking protection)

The surge current factor is the ratio between the actual current and the parameterized nominal current.

Table 2-4 Trigger times [s] (5 A and 16 A determined across entire temperature range)

I/IN3	Class 5	Class 10A	Class 10	Class 15	Class 20	Class 25	Class 30	Class 35	Class 40
1.2	34.6	236.0	403.0	456.0	574.0	678.0	808.0	864.0	1014.0
1.5	13.7	67.5	136.0	166.0	194.0	261.0	289.0	327.0	382.0
2	6.5	30.3	61.5	76.3	88.1	121.0	131.0	150.0	176.0
3	2.7	12.0	24.4	30.4	34.9	48.2	52.4	60.1	70.2
4	1.5	4.6	9.3	11.6	13.1	18.3	19.8	22.6	25.8
5	1.0	3.2	6.4	7.9	9.0	12.5	13.5	15.3	17.4
6	0.7	2.5	4.9	6.0	6.8	9.4	10.2	11.5	12.9
7	0.5	2.0	4.0	4.9	5.5	7.6	8.2	9.3	10.3
8	0.4	1.8	3.4	4.1	4.7	6.4	7.0	7.8	8.6
9	0.3	1.2	2.4	3	3.6	4.8	5.2	5.9	6.9
10	0.3	1	2	2.4	2.9	3.9	4.2	4.8	5.6

For the EMM 3-.../500AC-16-IFS, blocking monitoring is activated with a motor current of 60 A or higher (see trigger characteristic).

According to the relevant trigger characteristic, shutdown occurs, at the latest, at eight times the current (surge current factor 8).

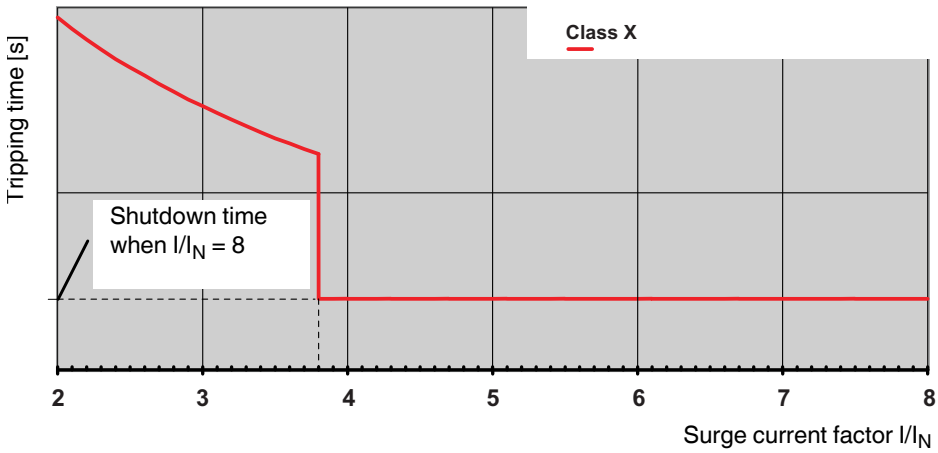


Figure 2-8 Shutdown time

The following tripping times apply for blocking monitoring according to the class curve:

Class	Tripping time
Class 5	0.4 s
Class 10A	1.8 s
Class 10	3.4 s
Class 15	4.1 s
Class 20	4.7 s
Class 25	6.4 s
Class 30	7.0 s
Class 35	7.8 s
Class 40	8.6 s

Example 1:

Parameterized nominal current I_N = 5 A / Surge current 2 x I_N = 10 A / Class curve = Class 5

The EMM shuts the outputs down after 6.5 s as the measuring range is not exceeded.

Example 2:

Parameterized nominal current I_N = 16 A / Surge current 8 x I_N = 128 A / Class curve = Class 30

The EMM shuts the outputs down after 7.0 s as the measuring range is exceeded.

2.5 Safety functions

Table 2-5 System conditions

Database	SN 29500
System type	Type B, comprising subsystems
Standard	IEC 61508
Beta factor	2%
MTTF [years] - Mean time to failure at an ambient temperature of 40°C	53.4 (EMM 3- 24DC/500AC-...); 19.8 (EMM 3-230AC/500AC-...)

NOTE: Possible damage to the device

When used in ATEX applications, at least one of the motor protection functions (thermistor monitoring or bimetal function) must be activated.

Safe shutdown	EMM 3- 24DC/…	EMM 3-230AC/...
Ambient temperature	40°C	40°C
MTTFd [years] - Mean time to dangerous failure	165	115
Shutdown time [ms]	40	80
λsd [FIT] - Safe, detectable	225	236
λsu [FIT] - Safe, undetectable	678	1344
λdd [FIT] - Dangerous, detectable	608	676
λdu [FIT] - Dangerous, undetectable	85	317
SFF [%] - Safe failure fraction	94.6	87.7
DCS [%] - Diagnostic coverage safe	24.8	14.9
DC [%] - Diagnostic coverage	87.7	68.1
PFH - Probability of failure per hour	85×10^{-9}	317×10^{-9}

Table 2-6 Safety level for safe shutdown

Standard	Level
IEC 61508-1	SIL 1
ISO 13849-1	PL b
EN 954-1	Category 1

Motor protection by bimetal	EMM 3- 24DC/…	EMM 3-230AC/...
Ambient temperature	40°C	40°C
MTTFd [years] - Mean time to dangerous failure	480	220
Shutdown time [ms]	According to parameterized class curve, IEC 60947	
λsd [FIT] - Safe, detectable	267	258
λsu [FIT] - Safe, undetectable	528	1123
λdd [FIT] - Dangerous, detectable	130	193
λdu [FIT] - Dangerous, undetectable	109	328
SFF [%] - Safe failure fraction	90	83
DCS [%] - Diagnostic coverage safe	33.6	18.6
DC [%] - Diagnostic coverage	54.5	37

Table 2-7 Safety level for motor protection by bimetal

Standard	Level
IEC 61508-1	SIL 1

Motor protection by thermistor	EMM 3- 24DC/…	EMM 3-230AC/...
Ambient temperature	40°C	40°C
MTTFd [years] - Mean time to dangerous failure	534	230
Shutdown time [ms]	1000	1000
λsd [FIT] - Safe, detectable	164	154
λsu [FIT] - Safe, undetectable	529	1124
λdd [FIT] - Dangerous, detectable	115	178
λdu [FIT] - Dangerous, undetectable	99	319
SFF [%] - Safe failure fraction	89	82
DCS [%] - Diagnostic coverage safe	23.5	12.0
DC [%] - Diagnostic coverage	53.7	36

Table 2-8 Safety level for motor protection by thermistor

Standard	Level
IEC 61508-1	SIL 1

Additional safety data is available on request.

3 IFS-CONFSTICK-L memory block

The IFS-CONFSTICK-L multifunctional memory block (Order No. 2901103) is used for easy storage and backup of configuration data.

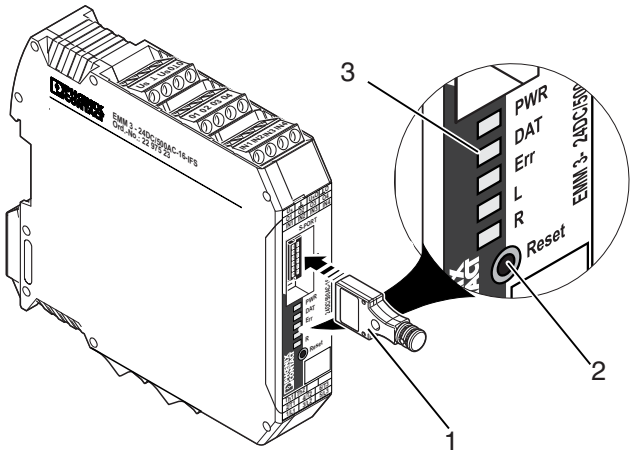


Figure 3-1 Operating and indication elements

1 IFS-CONFSTICK-L
2 Button
3 Status LEDs

3.1 Writing the device configuration to the IFS-CONFSTICK(-L)

1. Make sure that the IFS-CONFSTICK-L has not yet been inserted in the device.
2. Press the reset button on the EMM … IFS.
3. Insert the IFS-CONFSTICK-L in the device within 4 seconds.
   The copying of configuration and parameterization data is started.
   The DAT LED flashes while saving.
4. Wait until the DAT LED has gone out.
   Backup has been completed.
5. Remove the IFS-CONFSTICK-L from the device.

If an error is detected while saving or subsequently checking the data, the DAT and ERR LEDs flash simultaneously.

3.2 Loading the device configuration on the EMM...IFS

There are two ways of loading configuration and parameterization data.

3.2.1 Brand new device

1. Insert the IFS-CONFSTICK-L in the device.
2. Switch on the device.
   Transfer of the configuration and parameterization data starts automatically and the DAT LED flashes.
   Following transfer, the device is marked "already configured".
3. Remove the IFS-CONFSTICK-L from the device.
4. The next time the supply voltage is switched on, the new configuration will be valid.

If an error is detected while saving or subsequently checking the data, the DAT and ERR LEDs flash simultaneously.
The device then enters the safe state, because it is not configured.

3.2.2 Configured device

It is not possible to load the configuration and parameterization data while the motor is running.

1. Insert the IFS-CONFSTICK-L in the device.
   The configuration and parameterization data is checked automatically.
2. If another configuration is detected on the device, the DAT and ERR LEDs flash alternately.
3. Press the reset button within 6 seconds.

If the reset button is not pressed within 6 seconds, the DAT and ERR LEDs flash simultaneously (the ERR LED flashes at double the frequency) in order to indicate that the configuration has not been saved to the device.

4. Copying from the IFS-CONFSTICK-L to the device starts automatically.
   The DAT LED flashes while saving.
5. The next time the supply voltage is switched on, the new configuration will be valid.

If the configuration and parameterization data is invalid or an error has been detected, the DAT and ERR LEDs flash simultaneously and the data is not saved to the device.

3.3 Technical data

IFS-CONFSTICK-L	2901103
General data	
Memory used	2 MB
Rewritability	100,000 cycles
Dimensions (width x height x depth)	16.5 mm x 6.5 mm x 39.5 mm
Weight	4.5 g, approximately
Ambient conditions	
Ambient temperature (operation)	-25°C ... 60°C
Ambient temperature (storage/transport)	-25°C ... 60°C

4 EM-PB-GATEWAY-IFS PROFIBUS module

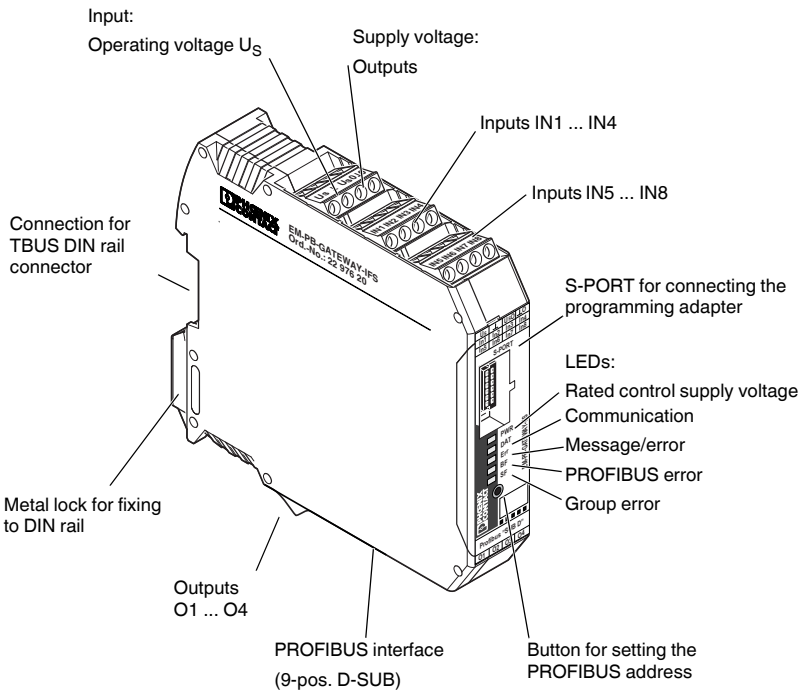


Figure 4-1 EM-PB-GATEWAY-IFS

The EM-PB-GATEWAY-IFS PROFIBUS module (Order No. 2297620) is a module that enables EMM...IFS modules to be connected to PROFIBUS DP. The module is certified according to specification DPV1 (EN 50170).

The EM-PB-GATEWAY-IFS can communicate with up to 31 EMM...IFS modules (slaves) via TBUS. Eight digital inputs and four outputs can be freely parameterized. The gateway can be operated by any standard-compliant C0 master in cyclic data exchange. It also supports acyclic connections.

In addition, the EM-PB-GATEWAY-IFS supports the fail safe state: the switching behavior in the event of PROFIBUS errors can be influenced by the parameterization. Digital switching outputs enable direct control of the EMM...IFS (right/left rotation).

The assignment of the process data can be individually adapted to the application requirements by means of the GSD file (device master data). The GSD file (containing the characteristic communication features of the PROFIBUS module) is available on the Internet at www.phoenixcontact.net/catalog.

The PROFIBUS address is set using a button and/or a device (PC, memory stick, actuator) connected to the S-PORT as an option. The module does not provide PROFIBUS termination, an appropriate connector should be used for this, if required.

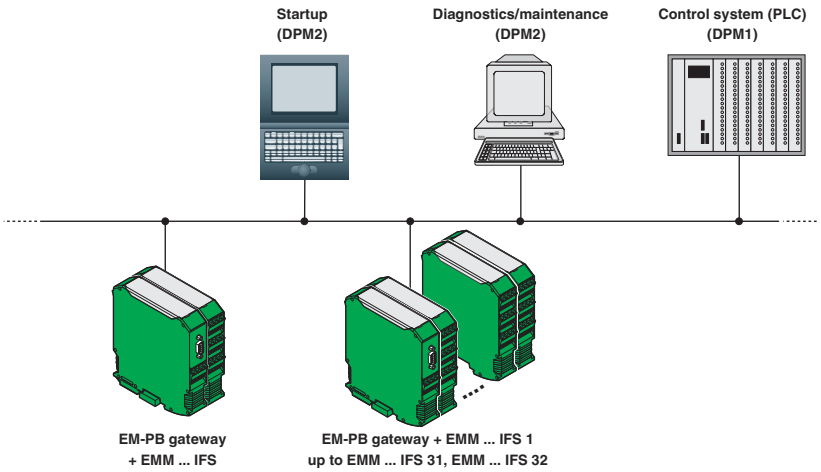


Figure 4-2 PROFIBUS module for electronic motor management modules

4.1 Definition of terms

PROFIBUS DP	PROFIBUS bus system with the DP protocol. DP stands for distributed periphery. The main task of PROFIBUS DP is fast cyclic data exchange between the central DP master and the I/O devices.
PROFIBUS DPV1	PROFIBUS DPV1 is an extension of the DP protocol. This means that acyclic data exchange of parameter, diagnostic, control, and test data is also possible.
DP master	A master that behaves according to standard EN 50170, Volume 2, PROFIBUS, with the DP protocol, is referred to as a DP master.
Class 1 master	A class 1 master is an active device in PROFIBUS DP. Cyclic data exchange with other devices is clearly indicated. Typical class 1 masters include PLCs with PROFIBUS DP connection.
Class 2 master	These types of devices are engineering, configuration or operating devices. They are used during startup, maintenance, and diagnostics to configure the connected devices, evaluate measured values, and request the device state.
DP slave, DP standard slave	A slave that is operated on the PROFIBUS bus with the PROFIBUS DP protocol and behaves according to standard EN 50170, Volume 2, PROFIBUS, is referred to as a DP slave.
DPV1 slave, xS7 slave	The EM-PB-GATEWAY-IFS is a DPV1 slave with the following properties: – Supports the S7 model (diagnostic alarms, process alarms) – Can be parameterized – Reads/writes data records
Type files/GSD	Device master data (GSD) contains DP slave descriptions in a uniform format. Using GSD simplifies the configuration of the master and DP slave.

4.2 Connection notes

4.2.1 Mains connection and line protection

WARNING: Dangerous contact voltage

Never carry out work when voltage is present.

This work may only be carried out by qualified personnel who are familiar with the necessary safety precautions.

The rated control supply voltage and control voltage inputs must be operated with power supply modules according to DIN 19240 (maximum residual ripple of 5%).

In order to avoid inductive or capacitive coupling of disturbing pulses where long control lines are used, we recommend using shielded cables.

CAUTION: Wiring safety

If you want to clamp two conductors under one terminal point, you must use conductors with the same conductor cross section.

4.2.2 Block diagram

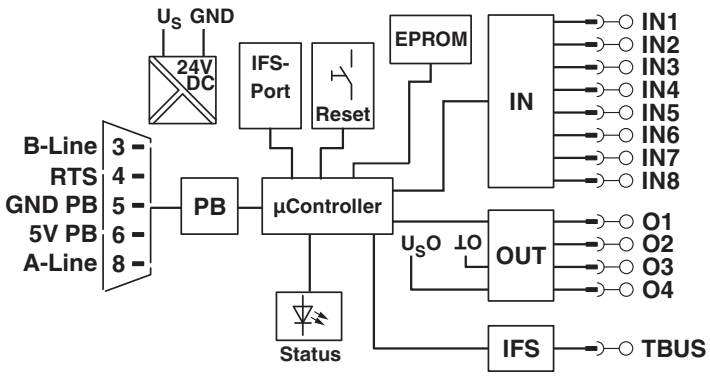


Figure 4-3 Block diagram

4.2.3 TBUS DIN rail connector

The EM-PB-GATEWAY-IFS can be mounted on a DIN rail. For detailed information about mounting/removal, please refer to "TBUS DIN rail connector" on page 5-1.

4.2.4 Status LEDs

Five LEDs visualize the various operating states of the gateway.

The status LEDs are used to indicate the PROFIBUS address and the addresses of the connected IFS devices in parameterization mode when setting the address.

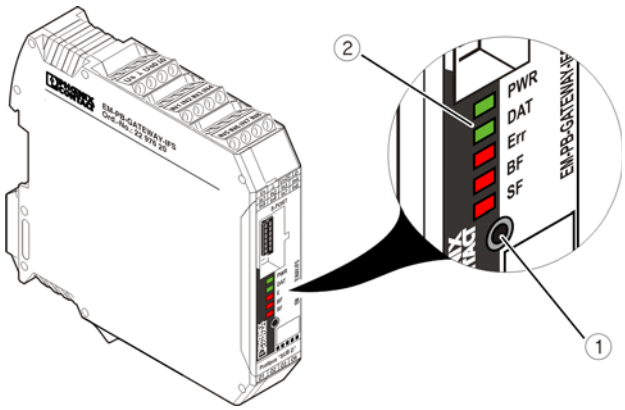


Figure 4-4 Operating and indication elements

1 Button for setting the PROFIBUS address

2 Status LEDs

LED	Description
PWR LED (green) OFF ON Flashing at 1.4 Hz (slow) Flashing at 2.8 Hz (fast)	**Device status** No supply voltage. Microcontroller does not start. Supply voltage OK. Microcontroller is running. Set PROFIBUS address IFS address assignment
DAT LED (green) OFF ON Flashing at 1.4 Hz (slow) Flashing at 2.8 Hz (fast)	**Communication** No data traffic Cyclic data traffic Device is being configured See Section 3, "IFS-CONFSTICK-L memory block"
ERR LED (red) OFF ON Flashing at 1.4 Hz (slow) Flashing at 2.8 Hz (fast)	**Device or process error** No error Serious internal error See Section 3, "IFS-CONFSTICK-L memory block" I/O error, e.g., output driver overload
BF LED (red) OFF ON Flashing at 1.4 Hz (slow) Flashing at 2.8 Hz (fast)	**PROFIBUS error** No error No cyclic data exchange (no C1 master present) PROFIBUS parameterization is invalid PROFIBUS configuration is invalid
SF LED (red) OFF ON Flashing at 1.4 Hz (slow) Flashing at 2.8 Hz (fast)	**Group error** No error Connected device has an internal error or is not present Process error or error in the I/O of a device PROFIBUS configuration and station structure do not match

4.2.5 S-PORT handling

The EM-PB-GATEWAY-IFS supports active extensions, e.g., IFS-USB-PROG-ADAPTER USB programming adapters (Order No. 2811271), as well as an optional IFS-CONFSTICK-L memory stick (Order No. 2901103).

4.2.6 Setting the PROFIBUS address

1. Press and hold down the button 1 (Figure 4-4 "Operating and indication elements") for at least six seconds (6 s).
2. The LEDs 2 on the EM-PB-GATEWAY-IFS indicate the current PROFIBUS address offset.
3. Set the PROFIBUS address offset by pressing the button 1 on the EM-PB-GATEWAY-IFS (see table).
4. Press the button 1 on the EM-PB-GATEWAY-IFS for six seconds (6 s).

The EM-PB-GATEWAY-IFS calculates the PROFIBUS address by adding the offset to the base address.

The base address is set to 0 by default.

Table 4-1 PROFIBUS address

LED code					
PWR	DAT	ERR	BF	SF	Offset
0	0	0	0	0	0
0	0	0	0	1	1
0	0	0	1	0	2
0	0	0	1	1	3
0	0	1	0	0	4
0	0	1	0	1	5
0	0	1	1	0	6
0	0	1	1	1	7
0	1	0	0	0	8
0	1	0	0	1	9
0	1	0	1	0	10
0	1	0	1	1	11
0	1	1	0	0	12
0	1	1	0	1	13
0	1	1	1	0	14
0	1	1	1	1	15
1	0	0	0	0	16
1	0	0	0	1	17
1	0	0	1	0	18
1	0	0	1	1	19
1	0	1	0	0	20
1	0	1	0	1	21
1	0	1	1	0	22
1	0	1	1	1	23
1	1	0	0	0	24
1	1	0	0	1	25
1	1	0	1	0	26
1	1	0	1	1	27
1	1	1	0	0	28
1	1	1	0	1	29
1	1	1	1	0	30
1	1	1	1	1	31

Default offset

4.2.7 Setting the INTERFACE system address

1. Press the button 1 (Figure 4-4 "Operating and indication elements") for 12 seconds (12 s).
2. The LEDs 2 on the EM-PB-GATEWAY-IFS indicate the current IFS address of the first device on the IFS bus.
3. Set the IFS address by pressing the button 1 on the EM-PB-GATEWAY-IFS (see table).
4. Press the button on the first device, for example:

   EMM...IFS = Reset button
5. The IFS address is applied on the first device.
6. The address of the next device is indicated on the EM-PB-GATEWAY-IFS. Repeat steps 3 and 4 until all the devices have been addressed.
7. Press and hold down the button 1 for at least six seconds (6 s).
8. All status LEDs light up briefly.

Table 4-2 INTERFACE system address

Table 4-3 LED code					IFSM address
PWR	**DAT**	**ERR**	**BF**	**BF**	
0	0	0	0	0	32
0	0	0	0	1	1
0	0	0	1	0	2
0	0	0	1	1	3
0	0	1	0	0	4
0	0	1	0	1	5
0	0	1	1	0	6
0	0	1	1	1	7
0	1	0	0	0	8
0	1	0	0	1	9
0	1	0	1	0	10
0	1	0	1	1	11
0	1	1	0	0	12
0	1	1	0	1	13
0	1	1	1	0	14
0	1	1	1	1	15
1	0	0	0	0	16
1	0	0	0	1	17
1	0	0	1	0	18
1	0	0	1	1	19
1	0	1	0	0	20
1	0	1	0	1	21
1	0	1	1	0	22
1	0	1	1	1	23
1	1	0	0	0	24
1	1	0	0	1	25
1	1	0	1	0	26
1	1	0	1	1	27
1	1	1	0	0	28
1	1	1	0	1	29
1	1	1	1	0	30
1	1	1	1	1	31

4.3 PROFIBUS telegrams

4.3.1 Structure of the parameterization telegram

Each time the EM-PB-GATEWAY-IFS is started up on PROFIBUS DP, parameters are transmitted to the device. Depending on the master module used, either standard parameters or standard and IF system-specific parameters are transmitted.

The setting of startup parameters is defined by the GSD file and carried out using the configuration tool of the master module.

Table 4-4 Parameterization telegram

Parameter	Value/description
Behavior at PROFIBUS errors	0: Reset outputs and Producer PDCs 1: Hold last state
Control of digital outputs	0 = Output is controlled by PB 1 = Output is controlled by IFS master Bit 3: Output 4 Bit 2: Output 3 Bit 1: Output 2 Bit 0: Output 1
Real power [W] (x 0.001) : 1000	Measuring range final value for real power Representation range (default): -32512 ... 32512 W
Reactive power [var] (x 0.001) : 1000	Measuring range final value for reactive power [var] Representation range (default): -32512 ... 32512 var
Power [VA] (x 0.001) : 1000	Measuring range final value for apparent power [VA] Representation range (default): -32512 ... 32512 VA
Voltage [V] (x 0.001) : 100	Measuring range final value for voltage [V] Representation range (default): -3251.2 ... 3251.2 V
Current [A] (x 0.001) : 1	Measuring range final value for current [A] Representation range (default): -32.512 ... 32.512 A
Switch cycles (x 1) : 1	Measuring range final value for operating cycle counters Representation range (default): 0 ... 32512 cycles
Operation time [h] (x 0.001) : 1	Measuring range final value for operating hours counter Representation range (default): 0 ... 32.512 h
Energy [kWh] (x 0.001) : 1	Measuring range final value for power meter Representation range (default): -32.512 ... 32.512 kWh
Userdefined 1 (x 0.001) : 1000	Representation range (default): -32512 ... 32512
Userdefined 2 (x 0.001) : 1000	Userdefined Scaling 2 (x 0.001) Representation range (default): -32512 ... 32512
IFS-Application	0: NON 1: ELR, EMM
Byte order	0: Intel 1: Motorola

4.3.2 Structure of the diagnostic telegram

The diagnostic telegram indicates the current operating state of the devices. It is sent when requested by the PROFIBUS master.

The system distinguishes between status and error messages. Error messages are marked "E" and are sent to the master with high priority, i.e., as soon as an error is detected diagnostic data is sent to the master instead of process data. However, status messages are only sent if no process data needs to be transmitted.

Table 4-5 Diagnostic telegram

Byte	Bit	Remark	
0	7 ... 0	Station status 1 (DP standard)	
1	7 ... 0	Station status 2 (DP standard)	
2	7 ... 0	Station status 3 (DP standard)	
3	7 ... 0	Address of the PROFIBUS master	
4	7 ... 0	Slave ID (high byte)	
5	7 ... 0	Slave ID (low byte)	
6	7 ... 0	07h: Header of device-specific diagnostics (DPV1)	
7	7 ... 0	81h: Type of diagnostics	
8	7 ... 0	00h: Slot number	
9	7 ... 0	00h: Reserved	
10		Modul state (Low Byte) (LPC/DPC) Errors	
	7	Configuration mode is set	M
	6	Reserved	
	5	Switch output overload	E
	4	Error power supply detected	E
	3	Checksum config area is invalid	E
	2	Checksum vendor area is invalid	E
	1	Reserved	
	0	Undefined, unspecified internal error	E
11		Modul state (High Byte) DPC Errors	
	7	Stack error	E
	6	Checksum ROM is invalid	E
	5	Internal communication error	E
	4	Digital input error	E
	3	Reserved	M
	2	Reserved	M
	1	Reserved	M
	0	Reserved	E

Table 4-5 Diagnostic telegram [...]

Byte	Bit	Remark	
12		IFSM Slave Error 1 (faulty module or device is not present)	
	7	Slave 8: error or missing	E
	6	Slave 7: error or missing	E
	5	Slave 6: error or missing	E
	4	Slave 5: error or missing	E
	3	Slave 4: error or missing	E
	2	Slave 3: error or missing	E
	1	Slave 2: error or missing	E
	0	Slave 1: error or missing	E
13		IFSM Slave Error 2 (faulty module or device is not present)	
	7	Slave 16: error or missing	E
	6	Slave 15: error or missing	E
	5	Slave 14: error or missing	E
	4	Slave 13: error or missing	E
	3	Slave 12: error or missing	E
	2	Slave 11: error or missing	E
	1	Slave 10: error or missing	E
	0	Slave 9: error or missing	E
14		IFSM Slave Error 3 (faulty module or device is not present)	
	7	Slave 24: error or missing	E
	6	Slave 23: error or missing	E
	5	Slave 22: error or missing	E
	4	Slave 21: error or missing	E
	3	Slave 20: error or missing	E
	2	Slave 19: error or missing	E
	1	Slave 18: error or missing	E
	0	Slave 17: error or missing	E
15		IFSM Slave Error 4 (faulty module or device is not present)	
	7	Slave 32: error or missing	E
	6	Slave 31: error or missing	E
	5	Slave 30: error or missing	E
	4	Slave 29: error or missing	E
	3	Slave 28: error or missing	E
	2	Slave 27: error or missing	E
	1	Slave 26: error or missing	E
	0	Slave 25: error or missing	E

Table 4-5 Diagnostic telegram [...]

Byte	Bit	Remark	
16		IFSM Slave Process, Peripherie Error 1	
	7	Slave 8: process or peripherie error	M
	6	Slave 7: process or peripherie error	M
	5	Slave 6: process or peripherie error	M
	4	Slave 5: process or peripherie error	M
	3	Slave 4: process or peripherie error	M
	2	Slave 3: process or peripherie error	M
	1	Slave 2: process or peripherie error	M
	0	Slave 1: process or peripherie error	M
17		IFSM Process, Peripherie Error 2	
	7	Slave 16: process or peripherie error	M
	6	Slave 15: process or peripherie error	M
	5	Slave 14: process or peripherie error	M
	4	Slave 13: process or peripherie error	M
	3	Slave 12: process or peripherie error	M
	2	Slave 11: process or peripherie error	M
	1	Slave 10: process or peripherie error	M
	0	Slave 9: process or peripherie error	M
18		IFSM Process, Peripherie Error 3	
	7	Slave 24: process or peripherie error	M
	6	Slave 23: process or peripherie error	M
	5	Slave 22: process or peripherie error	M
	4	Slave 21: process or peripherie error	M
	3	Slave 20: process or peripherie error	M
	2	Slave 19: process or peripherie error	M
	1	Slave 18: process or peripherie error	M
	0	Slave 17: process or peripherie error	M
19		IFSM Device Process, Peripherie 4	
	7	Slave 32: process or peripherie error	M
	6	Slave 31: process or peripherie error	M
	5	Slave 30: process or peripherie error	M
	4	Slave 29: process or peripherie error	M
	3	Slave 28: process or peripherie error	M
	2	Slave 27: process or peripherie error	M
	1	Slave 26: process or peripherie error	M
	0	Slave 25: process or peripherie error	M

Table 4-5 Diagnostic telegram [...]

Byte	Bit	Remark	
20		Channel state 1	
	7	Reserved	M
	6	Reserved	M
	5	Reserved	M
	4	Reserved	M
	3	Reserved	M
	2	Reserved	M
	1	Reserved	M
	0	Reserved	M
21		Channel state 2	
	7	"IFSM-Bus-Error"	M
	6	"IFSM-Bit-Error"	M
	5	"IFSM-Cyclic-Data"	M
	4	"IFSM-Acyclic-Data"	M
	3	"IFSM-Invalid-Bus-Cycle-Time"	M
	2	Reserved	M
	1	Reserved	M
	0	Reserved	M
22		Channel state 3	
	7	Reserved	M
	6	Reserved	M
	5	Reserved	M
	4	Reserved	M
	3	Reserved	M
	2	Reserved	M
	1	Reserved	M
	0	Reserved	M
23		Channel state 4	
	7	Reserved	M
	6	Reserved	M
	5	Reserved	M
	4	Reserved	M
	3	Reserved	M
	2	Reserved	M
	1	Reserved	M
	0	Reserved	M

4.4 Configuration telegram

The EM-PB-GATEWAY-IFS is a modular slave. Depending on the configuration, a distinction is made between "automatic IFSM configuration" and "configuration via DTM".

For automatic configuration, the gateway generates the IFSM configuration and saves it to the connected slaves. However, the device addresses of the connected IFSM devices must be assigned manually first. Only use this operating mode for very small stations.

4.4.1 Digital input and output

NOTE:
The "Digital inputs/outputs" module is always active. It must always be initialized as the first module by the configuration telegram.

This is usually ensured by the settings in the GSD file. If this GSD function is not supported by the PROFIBUS configuration tool, this must be ensured by the user.

Table 4-6 OUT process data

Bit	Description
0	O1: Digital output 1
1	O2: Digital output 2
2	O3: Digital output 3
3	O4: Digital output 4
4	Reserved
5	Reserved
6	Reserved
7	Reserved
8	Reserved
9	Reserved
10	Reserved
11	Reserved
12	Reserved
13	Reserved
14	Reserved
15	Reserved

Bits I1 ... I8 mirror the state of the digital inputs of the gateway.

Table 4-7 IN process data

Bit	Description
0	I1: Digital input 1
1	I2: Digital input 2
2	I3: Digital input 3
3	I4: Digital input 4
4	I5: Digital input 5
5	I6: Digital input 6
6	I7: Digital input 7
7	I8: Digital input 8
8	Reserved
9	Reserved
10	Reserved
11	Reserved
12	Reserved
13	Reserved
14	Reserved
15	Reserved

4.4.2 Module status

The module status indicates the internal status of the gateway. It provides the same information that is found in the diagnostic telegram.

Table 4-8 Module status

Bit	Description
0	Device error (cannot be localized)
1	Reserved: Maximum device temperature exceeded
2	Manufacturer area of EEPROM, FLASH faulty
3	Configuration area of EEPROM, FLASH faulty
4	Supply voltage monitoring, reference voltage monitoring
5	Switching output monitoring (switching output overloaded)
6	Reserved
7	Configuration mode active
8	Reserved
9	Reserved
10	Reserved
11	Reserved
12	Memory stick faulty

Table 4-8 Module status [...]

Bit	Description
13	Inter-channel communication faulty
14	ROM check faulty
15	Stack overflow

4.4.3 Station status

The station status indicates the status of the entire station in four individual registers. In the "Slave Error State 1" and "Slave Error State 2" registers, IFS devices are indicated as faulty; they are either not present or a serious internal error has occurred. An error in one of these registers causes a diagnostic telegram to be sent.

In "Slave Peripherie Error 1" and "Slave Peripherie Error 2", devices are indicated which have detected an irregularity during operation. This includes, for example, overloads, overranges, but also changes in the operating mode such as the parameterization mode being activated.

Table 4-9 Slave Error State 1

Bit	Description
0	Device 1: Faulty, not present, serious internal error
1	Device 2: Faulty, not present, serious internal error
2	Device 3: Faulty, not present, serious internal error
3	Device 4: Faulty, not present, serious internal error
4	Device 5: Faulty, not present, serious internal error
5	Device 6: Faulty, not present, serious internal error
6	Device 7: Faulty, not present, serious internal error
7	Device 8: Faulty, not present, serious internal error
8	Device 9: Faulty, not present, serious internal error
9	Device 10: Faulty, not present, serious internal error
10	Device 11: Faulty, not present, serious internal error
11	Device 12: Faulty, not present, serious internal error
12	Device 13: Faulty, not present, serious internal error
13	Device 14: Faulty, not present, serious internal error
14	Device 15: Faulty, not present, serious internal error
15	Device 16: Faulty, not present, serious internal error

Table 4-10 Slave Error State 2

Bit	Description
0	Device 17: Faulty, not present, serious internal error
1	Device 18: Faulty, not present, serious internal error
2	Device 19: Faulty, not present, serious internal error
3	Device 20: Faulty, not present, serious internal error
4	Device 21: Faulty, not present, serious internal error
5	Device 22: Faulty, not present, serious internal error
6	Device 23: Faulty, not present, serious internal error
7	Device 24: Faulty, not present, serious internal error
8	Device 25: Faulty, not present, serious internal error
9	Device 26: Faulty, not present, serious internal error
10	Device 27: Faulty, not present, serious internal error
11	Device 28: Faulty, not present, serious internal error
12	Device 29: Faulty, not present, serious internal error
13	Device 30: Faulty, not present, serious internal error
14	Device 31: Faulty, not present, serious internal error
15	Device 32: Faulty, not present, serious internal error

Table 4-11 Slave Peripherie State 1

Bit	Description
0	Device 1: Process error, message
1	Device 2: Process error, message
2	Device 3: Process error, message
3	Device 4: Process error, message
4	Device 5: Process error, message
5	Device 6: Process error, message
6	Device 7: Process error, message
7	Device 8: Process error, message
8	Device 9: Process error, message
9	Device 10: Process error, message
10	Device 11: Process error, message
11	Device 12: Process error, message
12	Device 13: Process error, message
13	Device 14: Process error, message
14	Device 15: Process error, message
15	Device 16: Process error, message

Table 4-12 Slave Peripherie State 2

Bit	Description
0	Device 17: Process error, message
1	Device 18: Process error, message
2	Device 19: Process error, message
3	Device 20: Process error, message
4	Device 21: Process error, message
5	Device 22: Process error, message
6	Device 23: Process error, message
7	Device 24: Process error, message
8	Device 25: Process error, message
9	Device 26: Process error, message
10	Device 27: Process error, message
11	Device 28: Process error, message
12	Device 29: Process error, message
13	Device 30: Process error, message
14	Device 31: Process error, message
15	Device 32: Process error, message

4.4.4 EMM objects

ELR/EMM Control (Device:1) ... ELR/EMM Control (Device:8)

Table 4-13 ELR/EMM Control

Bit	Description
15 ... 8	Status of the digital output information (O8 ... O1)
7	MSG reset: Group message; activation by positive edge
6	IND reset: Group error message; activation by positive edge
5 ... 3	Reserved
2	Left rotation request; activation by positive edge
1	Stop request; stop overrides all requests
0	Right rotation request; activation by positive edge

Table 4-14 ELR Status Word

Bit	Description
15 ... 8	Status of the digital inputs
7	MSG message: Group message
6	IND error: Group error message
5 ... 3	Reserved
2	Left rotation confirmation
1	Stop confirmation
0	Right rotation confirmation

Table 4-15 ELR/EMM Module State 1

Bit	Description
0	Device error (cannot be localized)
1	An error occurred when accessing the external EEPROM.
2	Channel 2: Manufacturer area of EEPROM, FLASH
3	Channel 2: Configuration area of EEPROM, FLASH
4	Channel 1: Configuration area of EEPROM, FLASH
5	Supply voltage monitoring, reference voltage monitoring
6	Reserved
7	Digital input monitoring
8	Error acknowledgment faulty
9	Channel 1: Logical program sequence monitoring faulty
10	Reserved
11	Channel 1: Return stack overflow

Table 4-15 ELR/EMM Module State 1 [...]

Bit	Description
12	Channel 1: Data stack overflow
13	Channel 1: ROM monitoring
14	Channel 1: RAM monitoring
15	Channel 1: Saved reference value faulty

Table 4-16 ELR/EMM Module State 2

Bit	Description
0	Inter-channel communication to channel 1 faulty
1	Inter-channel communication to channel 2 faulty
2	An error occurred during the EEPROM synchronization.
3	Collecting diagnosis for digital outputs (EMM 24 DC)
4	Channel 1: GNDa has left the tolerance range.
5	Reserved
6	Reserved
7	Test mode
8	Drive control: LOCAL 1
9	Drive control: LOCAL 2
10	Drive control: LOCAL 3
11	Drive control: Startup tool
12	Release of the configuration mode
13	Reserved
14	Cyclic bus communication
15	Reserved

Table 4-17 ELR/EMM Channel State 1

Bit	Description
0	Mains limit monitoring, working area underrange
1	Mains limit monitoring, working area overrange
2	Mains symmetry monitoring
3	Phase failure (UL1 - UL3)
4	Mains failure (mains regeneration time)
5	Mains synchronicity
6	Limit switch left
7	Limit switch right
8	Execution time at switch-on moment
9	Execution time at switch-off moment

Table 4-17 ELR/EMM Channel State 1 [...]

Bit	Description
10	Response time when switched off
11	Response time when switched on
12	Ground fault, insulation error (mains monitoring time)
13	Starts per time (pre-warning level)
14	Starts per time (error)
15	Output current flowing (5% nominal motor current)

Table 4-18 ELR/EMM Channel State 2

Bit	Description
0	Universal monitoring 1
1	Universal monitoring 2
2	Universal monitoring 3
3	Universal monitoring 4
4	Universal monitoring 5
5	Universal monitoring 6
6	Universal monitoring 7
7	Universal monitoring 8
8	"Left rotation" request
9	"Right rotation" request
10	Drive >>; (current flow is evaluated)
11	Drive >; (current flow is evaluated)
12	Drive o; (current flow is evaluated)
13	Drive <; (current flow is evaluated)
14	Drive <<; (current flow is evaluated)
15	Drive enabled

Table 4-19 ELR/EMM Channel State 3

Bit	Description
0	4 Hz cycle: The signal is inverted every 125 ms
1	10 Hz cycle: The signal is inverted every 50 ms
2	Group message
3	Group error message
4	Drive control: Automatic / manual
5	Simultaneous activation of left and right rotation
6	IFSM bus error
7	Fault in test mode

Table 4-19 ELR/EMM Channel State 3 [...]

Bit	Description
8	Error acknowledgment 1
9	Error acknowledgment 2
10	Error acknowledgment 3
11	Error acknowledgment 4
12	Mains frequency invalid
13	Reserved
14	Reserved
15	Reserved

Table 4-20 ELR/EMM Channel State 4

Bit	Description
0	Safety-related disconnection group 1
1	Safety-related disconnection group 2
2	Error restoring the system state
3	Symmetry error between IL1 and IL3
4	Phase failure (IL1 - IL3)
5	Blocking achieved
6	Bimetal has tripped, acknowledgment only possible after minimum cooling time
7	Bimetal has tripped, acknowledgment possible
8	Interruption of motor line T1
9	Interruption of motor line T2
10	Interruption of motor line T3
11	Leaving the analog measuring range (EMM…5A)
12	Thermistor short circuit
13	Thermistor warning
14	Thermistor overtemperature
15	Thermistor wire break

4.5 Measured values - CONTACTRON motor manager EMM

An analog value is represented in a 16-bit data word in two's complement format (integer 16).

In addition to error code 8040h, which is generated by the EM-PB-GATEWAY-IFS if it is not possible to communicate with the assigned slaves, other error codes are defined. They also relate to the status of the measured value, not the state of the connected device.

Table 4-21 Error codes

PDC	Error
8001 h	Out of measuring/representation range (overrange)
8002 h	Open circuit, mains fault
8004 h	No valid measured value available or invalid measured value
8010 h	Additional error information available
8020 h	PDC not activated
8040 h	Module faulty or not ready to operate
8080 h	Out of measuring/representation range (underrange)

The following example shows the scaling of the measured values and the assignment to the PDC codes.

±20 mA	±10 V	±30,000 W	PDC data item
SL: -21,674	SL: -10.837	SL: -32512	
SH: 21,674	SH: 10.837	SH: 32512	
[mA]	[V]	[W]	[hex]
> +21.6746	> +10.837	> +32512	8001 Overrange
+ 21.6746	+ 10.837	+ 32512	7F00 (32512)
+20.0000	+10.0000	+30000	7530 (30000)
+0.666667 m	+333.33 m	+1	0001 (1)
0	0	0	0000
-0.666667 m	-333.33 m	-1	FFFF (-1)
-20	-10	-30000	8AD0 (-30000)
-21.6746	-10.837	-32512	8100 (-32512)
< -21.6746	< -10.837	< -32512	8080 Underrange

4.5.1 Available measured values

"P(ALL)":	Real power
√3 x "U(L1)":	Line voltage L1
√3 x "U(L2)":	Line voltage L2
√3 x "U(L3)":	Line voltage L3
"I(L1)":	Current, L1
"I(L2)":	Current, L2
"I(L3)":	Current, L3
"Energy":	Power meter
"COS PHI":	Cos Phi
"Frequency":	Mains frequency
"Operation time(left)":	Operating hours left
"Operation time(right)":	Operating hours right
"Cycle(left)":	Cycles left
"Cycle(right)":	Cycles right
"P(L1)":	Real power, L1
"P(L2)":	Real power, L2
"P(L3)":	Real power, L3
"Q(ALL)":	Reactive power
"S(ALL)":	Apparent power
"U(L1)":	Voltage, L1
"U(L2)":	Voltage, L2
"U(L3)":	Voltage, L3

For power meters, operating hours counters, and operating cycle counters, an 8001h error code is not generated in the event of overrun (> 32512). The counter is reset instead.

Additional status or measured values are available on request.

4.6 Technical data

EM-PB-GATEWAY-IFS	2297620
Power supply	
Operating voltage U_S	24 V DC
Permissible operating voltage range	-20% ... +25%
Nominal input current at U_{IN}	85 mA, typical plus load current of output
Input circuit	Surge protection Protection against polarity reversal

Digital inputs IN1 … IN8	
Input voltage	24 V DC
Permissible operating voltage range	-20 % ... +20 %
Nominal input current at U_{IN}	3 mA
Input circuit	Surge protection Protection against polarity reversal

Digital outputs O1 ... O4	
Maximum switching voltage	23 V DC (U_S - U_{Res} of the output)
Maximum switching current	500 mA
Residual voltage U_{Res} at 500 mA	1 V DC
Output circuit	Parallel protection against polarity reversal (6.3 A fuse, maximum)

General data	
Data interface/power supply test voltage	1.5 kV
Nominal operating mode	100% operating factor
Degree of protection	IP20
Pollution degree	2
Surge voltage category	III
Standards/specifications	EN 50178
Mounting position	Any
Mounting	Can be aligned without spacing
Housing material	Polyamide PA, non-reinforced
Dimensions (width x height x depth)	22.5 mm x 114.5 mm x 99 mm
Conductor cross section of COMBICON plug-in screw connection	0.2 mm - 2.5 mm^2 (24 - 12 AWG)
Weight	180 g

Data interface	IFS	PROFIBUS
Data rate	76.8 kbps	9.6 kbps ... 12 Mbps
Connection method	TBUS, S-port	9-pos. D-SUB

Ambient conditions	
Ambient temperature (operation)	-35°C ... +50°C
Ambient temperature (storage/transport)	-35°C ... +80°C

4.7 Integration in STEP 7

4.7.1 Flowchart

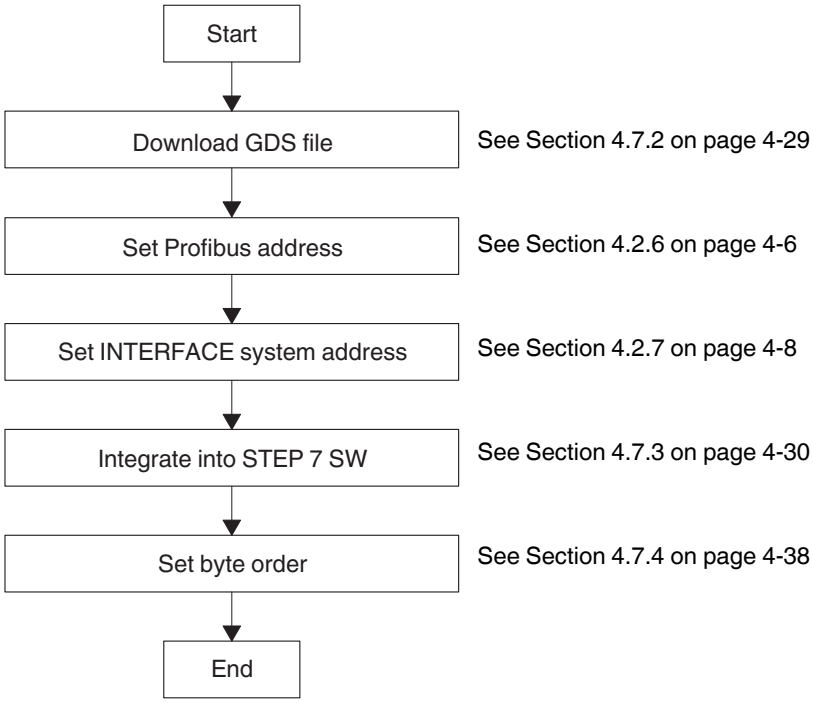


Figure 4-5 Flowchart

4.7.2 Downloading the GSD file

1. Access the Phoenix Contact online catalog (www.phoenixcontact.net/catalog) and search for "EM-PB-GATEWAY-IFS" or "2297620".
1. Select "Downloads".

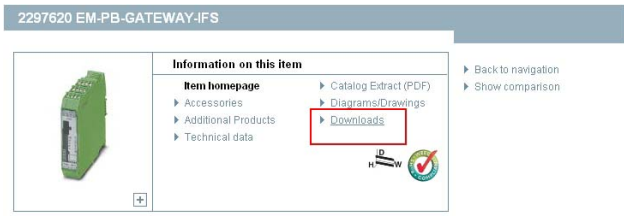


Figure 4-6 Selecting "Downloads" in the online catalog

2. Click on GSD file "PXC_0B51.gsd".

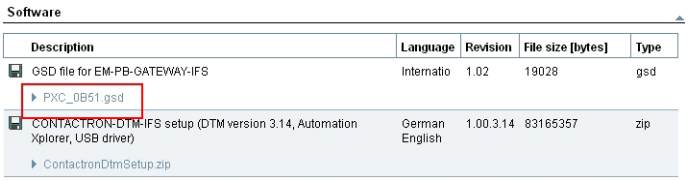


Figure 4-7 Selecting the GSD file in the online catalog

3. Read the General Terms and Conditions of Use.
4. Click "Accept" to confirm that you agree with the General Terms and Conditions of Use.

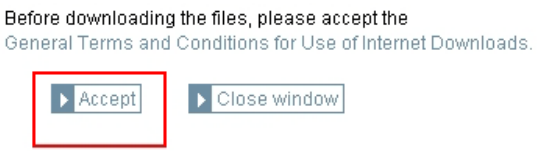


Figure 4-8 General Terms and Conditions of Use

5. Click "OK" to save the GSD file.

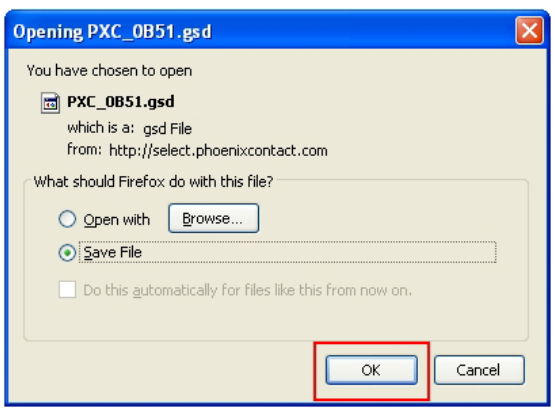


Figure 4-9 Saving the GSD file

4.7.3 Integration in STEP 7

1. Start SIMATIC Manager

Figure 4-10 SIMATIC Manager icon

2. Create a new project.

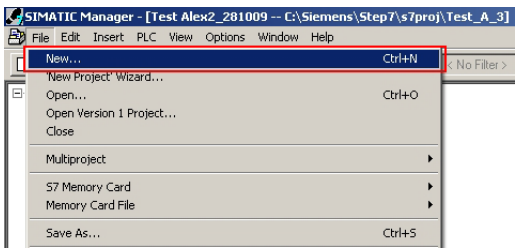


Figure 4-11 Creating a new project

3. Assign a project name and click "OK".

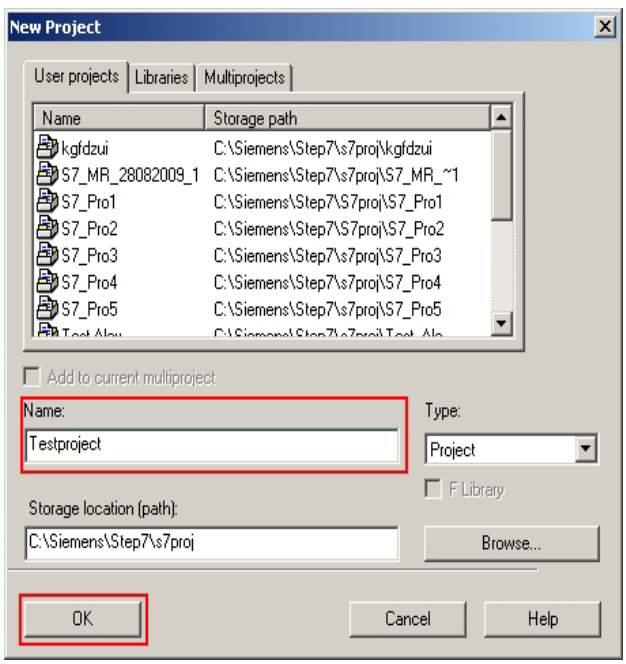


Figure 4-12 Saving the project name

4. Select the appropriate CPU in the "Insert, Station" menu.

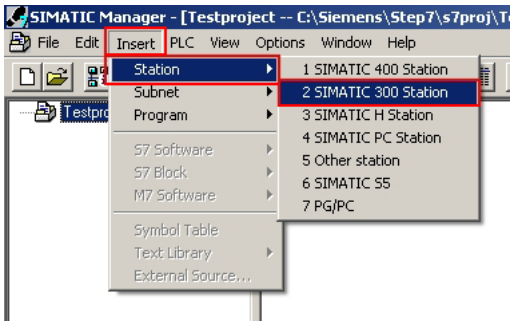


Figure 4-13 Selecting the CPU

5. The selected CPU is inserted in your project.

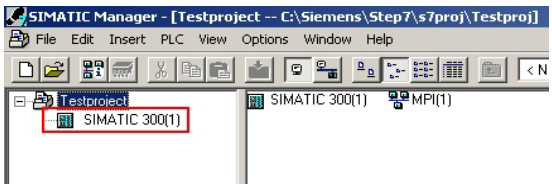


Figure 4-14 Selected CPU

6. Open the context menu of the inserted CPU.
7. Click on "Open Object".

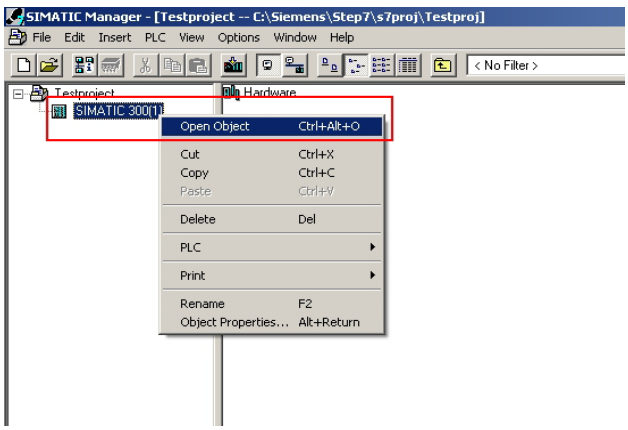


Figure 4-15 Opening the object

8. The hardware configuration is displayed.

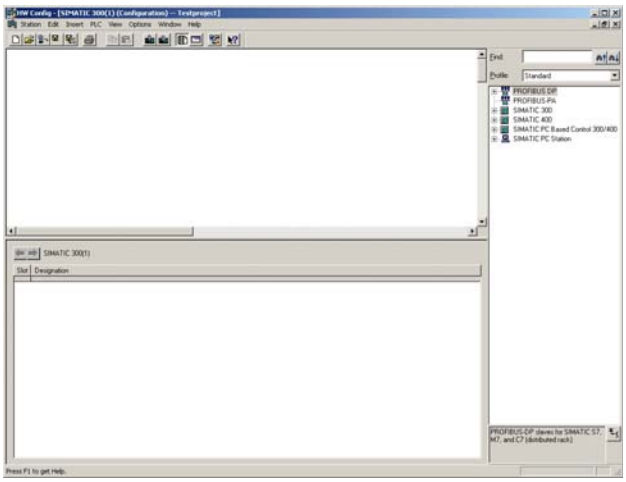


Figure 4-16 Hardware configuration

9. Close all application windows.

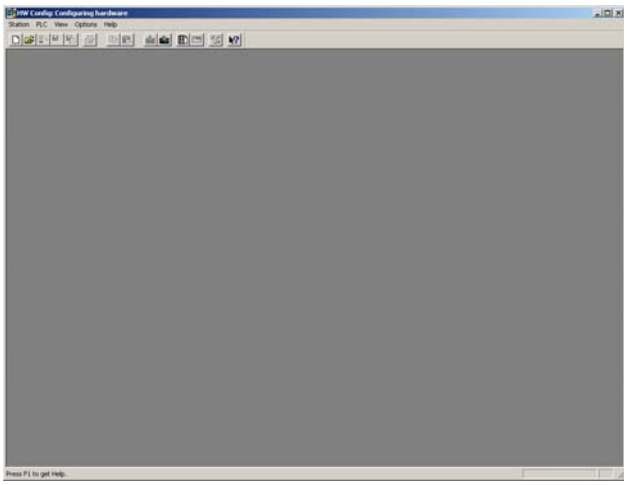


Figure 4-17 Hardware configuration

10. Select "Options, Install New GSD...".

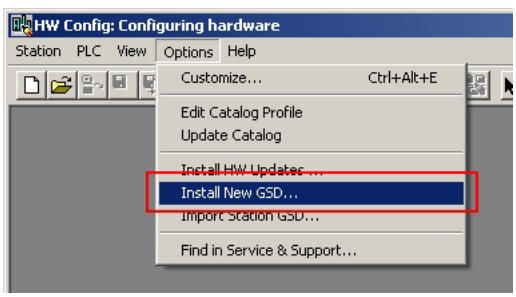


Figure 4-18 Installing a GSD file

11. Now load the GSD file downloaded in Section 4.7.2.
12. If the message "Installation has been completed successfully" appears, you can close the hardware editor.

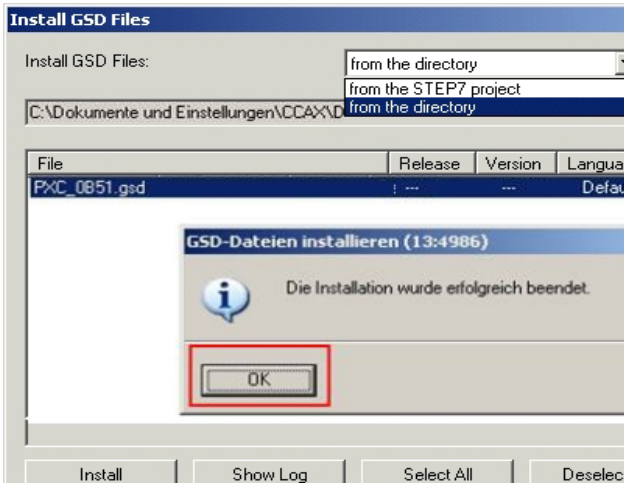


Figure 4-19 "Installation has been completed successfully" message

13. Open the context menu of the inserted CPU.
14. Click on "Open Object".

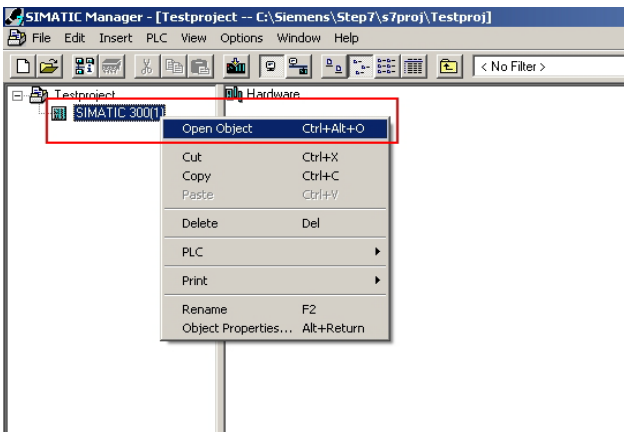


Figure 4-20 Opening the object

15. Select "View, Catalog".

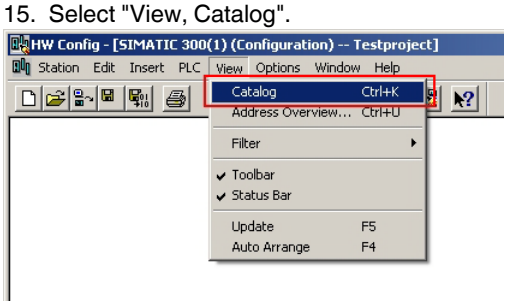


Figure 4-21 Selecting the catalog

16. The catalog window appears.

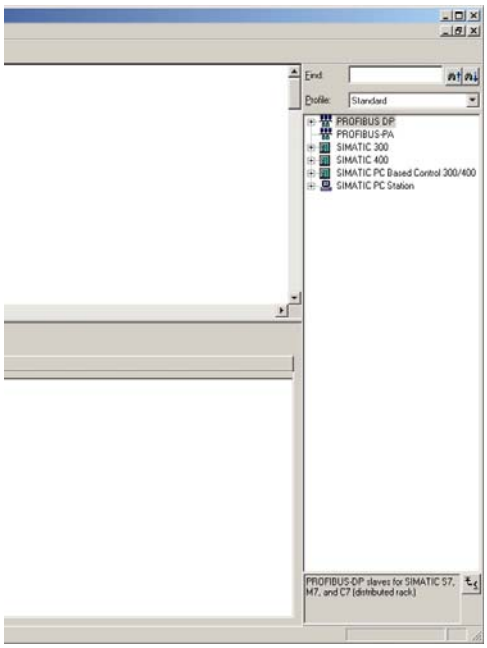


Figure 4-22 Catalog window

17. Suitable devices must be inserted your project here.

4.7.3.1 Example with SIMATIC 300

1. Select "SIMATIC 300, RACK-300, Rail" and insert this in your project.

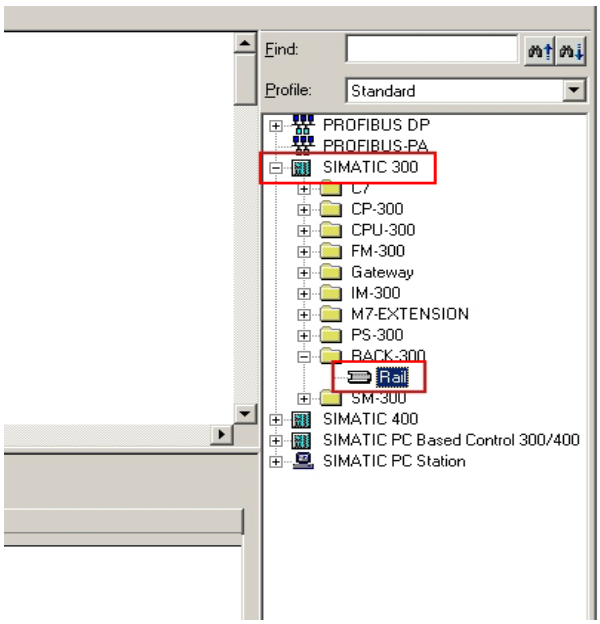


Figure 4-23 Selecting the DIN rail

2. Select "SIMATIC 300, CPU 315-2 DP, 6ES7-315-2AF03-0AB0, V1.2" and insert this in your project.

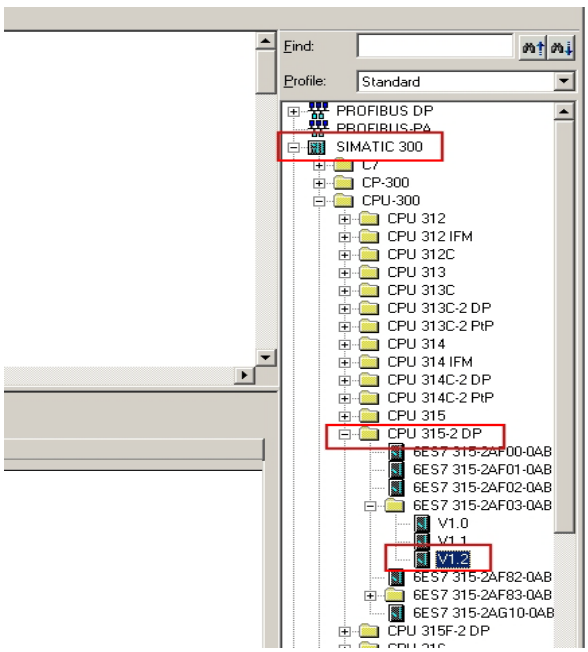


Figure 4-24 Selecting the CPU

3. The "Properties" window appears.
   Click on "New" and assign a new name for the bus line.

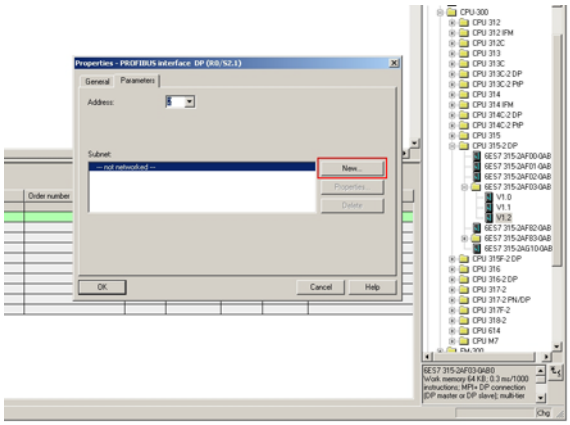


Figure 4-25 Bus line name

4. Select "PROFIBUS DP, Additional Field Devices, Gateway".
   Now move the EM-PB-GATEWAY-IFS to your project.

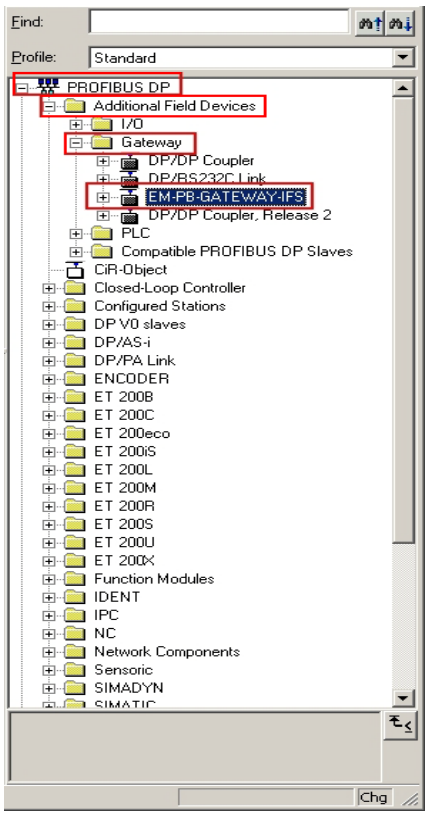


Figure 4-26 Selecting the gateway

5. The "Properties" window appears.
   Under "Address", you must select the address that was configured in the EM-PB-GATEWAY-IFS in Section 4.2.6.

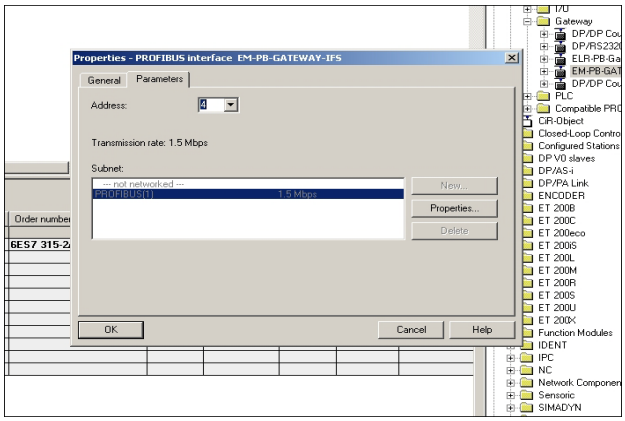


Figure 4-27 Gateway properties

6. You can now move the required GSD data to your project from under item "EM-PB-GATEWAY-IFS" in the catalog window.

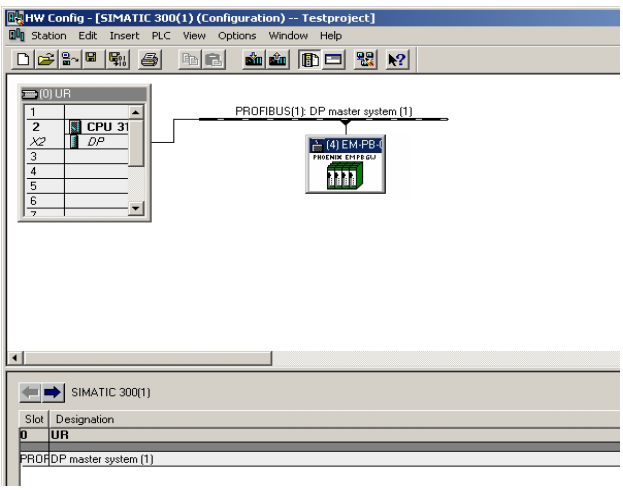


Figure 4-28 GSD data

4.7.4 Setting the byte order

1. Open the context menu of the EM-PB-GATEWAY-IFS and select "Object Properties".
2. Open the "Parameter Assignment" tab.

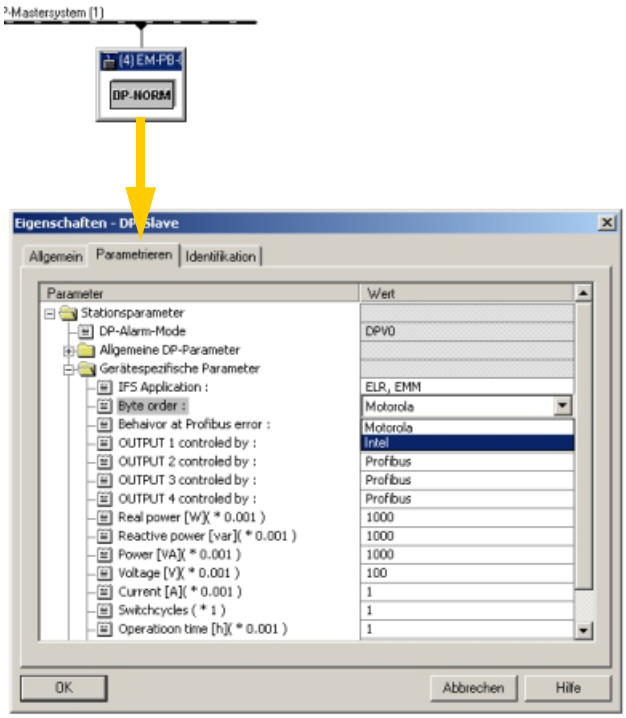


Figure 4-29 Setting the byte order

3. The byte order of the transferred data can be set here under "Device-specific parameters, Byte order".

Motorola: Big Endian (the high byte is saved first)
Intel: Little Endian (the low byte is saved first)

Example: Value "EMM: COS φ"

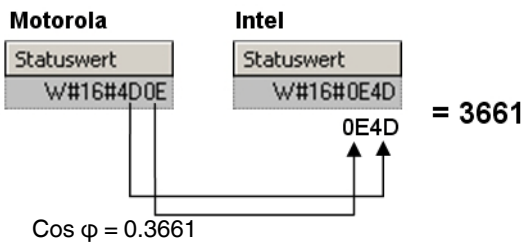


Figure 4-30 Example: Value "EMM: COS φ"

4.7.5 Explanation of GSD data

4.7.5.1 GSD data for EM-PB-GATEWAY-IFS

For a detailed description of the GSD data, please refer to Section 4.3.2, "Structure of the diagnostic telegram", Section 4.4.1, "Digital input and output", Section 4.4.2, "Module status", and Section 4.4.3, "Station status".

Universalmodul
Digital inputs, outputs
Gateway: Modul state
Gateway: Channel State 1
Gateway: Channel State 2
Gateway: Channel State 3
Gateway: Channel State 4
IFS: Slave Error State 1
IFS: Slave Error State 2
IFS: Peripherie State 1
IFS: Peripherie State 2

4.7.5.2 GSD data for EMM … IFS

For a detailed description of the GSD data, please refer to Section 4.4.4, "EMM objects" and Section 4.5.1, "Available measured values".

ELR, EMM- Objects ==========	
EMM: Control (Device:1)	1 = IFS address 1
EMM: Control (Device:2)	2 = IFS address 2
EMM: Control (Device:3)	3 = IFS address 3
EMM: Control (Device:4)	4 = IFS address 4
EMM: Control (Device:5)	5 = IFS address 5
EMM: Control (Device:6)	6 = IFS address 6
EMM: Control (Device:7)	7 = IFS address 7
EMM: Control (Device:8)	8 = IFS address 8
EMM: Status	
EMM: Module State 1	
EMM: Module State 2	
EMM: Channel State 1	

EMM: Channel State 2
EMM: Channel State 3
EMM: Channel State 4
EMM: P(ALL)
EMM: U(L1)
EMM: U(L2)
EMM: U(L3)
EMM: I(L1)
EMM: I(L2)
EMM: I(L3)
EMM: Electric Work
EMM: COS PHI
EMM: Frequency
EMM: Operation time (left)
EMM: Operation time (right)
EMM: Cycle (left)
EMM: Cycle (right)
EMM: P(L1)
EMM: P(L2)
EMM: Q(ALL)
EMM: S(ALL)
EMM: SQRT(3) * U(L1)
EMM: SQRT(3) * U(L2)
EMM: SQRT(3) * U(L3)

4.7.6 Example

The following modules are used in this example:

– SIMATIC S7-300
– EM-PB-GATEWAY-IFS
– EMM 3- 24DC/500AC-16-IFS

4.7.6.1 Hardware structure

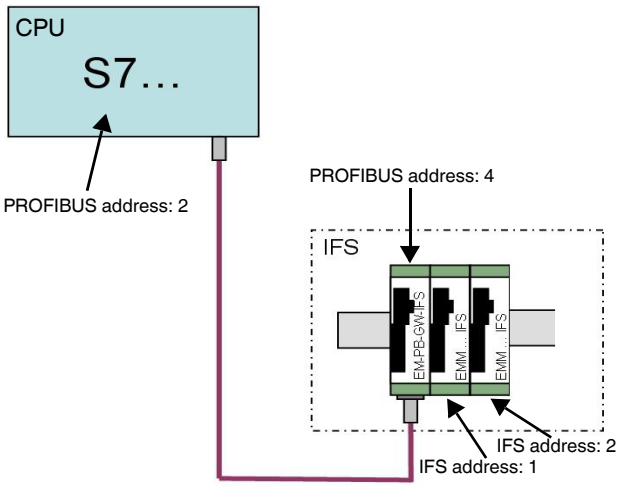


Figure 4-31 Hardware structure

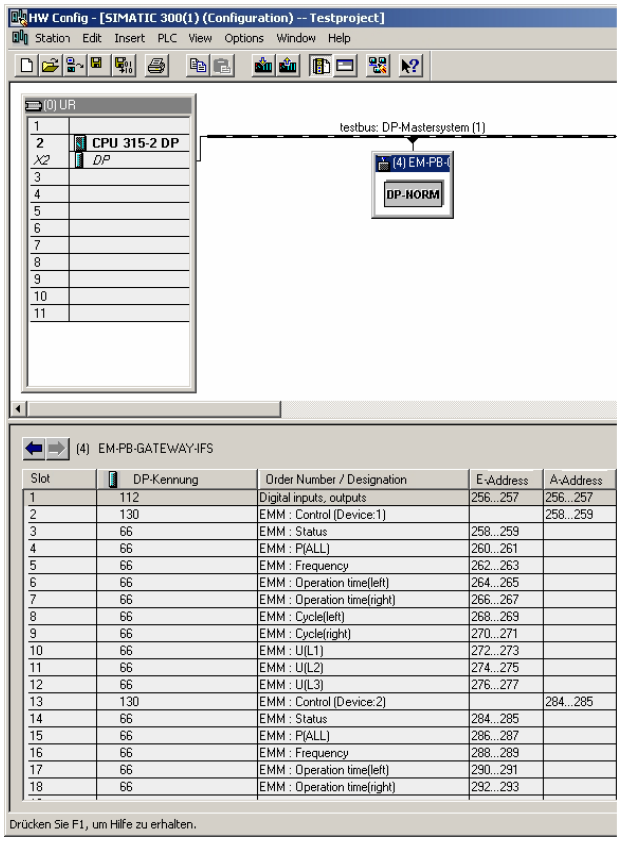
4.7.6.2 GSD values used

Order Number / Designation	
Digital inputs, outputs	Inputs and outputs of the EM-PB-GATEWAY-IFS

Order Number / Designation	
EMM : Control (Device:1)	Control word of the EMM, e.g., right rotation, left rotation, stop, reset, etc.
EMM : Status	Status word of the EMM, e.g., input state, direction of motor
EMM : P(ALL)	Display: Total real power
EMM : Frequency	Display: Frequency
EMM : Operation time(left)	Display: Operating hours counter (left rotation)
EMM : Operation time(right)	Display: Operating hours counter (right rotation)
EMM : Cycle(left)	Display: Cycles (left rotation)
EMM : Cycle(right)	Display: Cycles (right rotation)
EMM : U(L1)	Display: Voltage L1
EMM : U(L2)	Display: Voltage L2
EMM : U(L3)	Display: Voltage L3
EMM : I(L1)	Display: Current L1
EMM : I(L2)	Display: Current L2
EMM : I(L3)	Display: Current L3

Order Number / Designation	
EMM : Control (Device:2)	Control word of the EMM, e.g., right rotation, left rotation, stop, reset, etc.
EMM : Status	Status word of the EMM, e.g., input state, direction of motor
EMM : P(ALL)	Display: Total real power
EMM : Frequency	Display: Frequency
EMM : Operation time(left)	Display: Operating hours counter (left rotation)
EMM : Operation time(right)	Display: Operating hours counter (right rotation)
EMM : Cycle(left)	Display: Cycles (left rotation)
EMM : Cycle(right)	Display: Cycles (right rotation)
EMM : U(L1)	Display: Voltage L1
EMM : U(L2)	Display: Voltage L2
EMM : U(L3)	Display: Voltage L3
EMM : I(L1)	Display: Current L1
EMM : I(L2)	Display: Current L2
EMM : I(L3)	Display: Current L3

4.7.6.3 Monitoring variables



Slot	DP-Kennung	Order Number / Designation	E-Address	A-Address
1	112	Digital inputs, outputs	256...257	256...257
2	130	EMM : Control (Device:1)		258...259
3	66	EMM : Status	258...259	
4	66	EMM : P(ALL)	260...261	
5	66	EMM : Frequency	262...263	
6	66	EMM : Operation time(left)	264...265	
7	66	EMM : Operation time(right)	266...267	
8	66	EMM : Cycle(left)	268...269	
9	66	EMM : Cycle(right)	270...271	
10	66	EMM : U(L1)	272...273	
11	66	EMM : U(L2)	274...275	
12	66	EMM : U(L3)	276...277	
13	130	EMM : Control (Device:2)		284...285
14	66	EMM : Status	284...285	
15	66	EMM : P(ALL)	286...287	
16	66	EMM : Frequency	288...289	
17	66	EMM : Operation time(left)	290...291	
18	66	EMM : Operation time(right)	292...293	

Figure 4-32 Opening the context menu of the EM-PB-GATEWAY-IFS

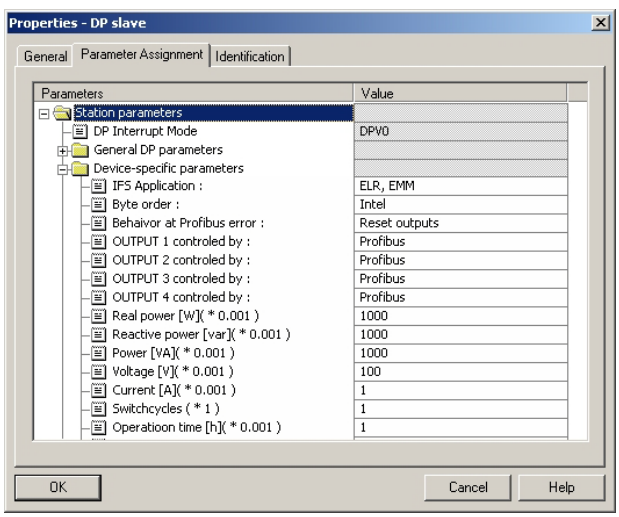


Figure 4-33 Object properties of the EM-PB-GATEWAY-IFS

In the object properties of the EM-PB-GATEWAY-IFS, the conversion factors for the measured values can be specified.

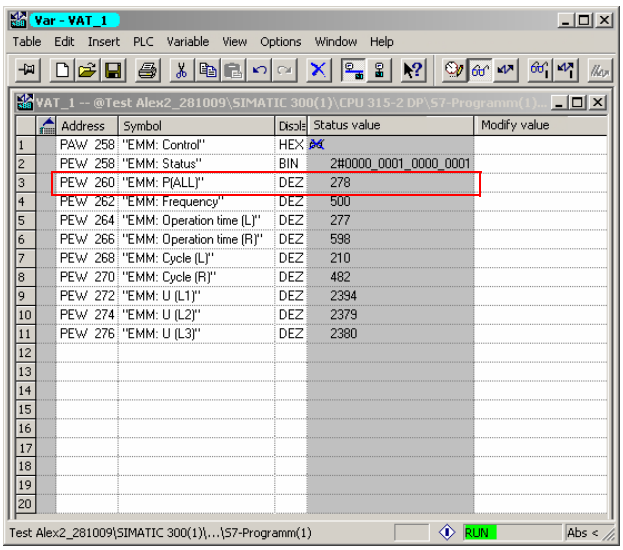


Figure 4-34 Variable overview

In the variable overview, individual values can be displayed.

In the example screen, you can see that the real power (All) is 278 W.

For each EM-PB-GATEWAY-IFS, a maximum of 32 words can be transferred during the cycle (66 ms).

5 TBUS DIN rail connector

Devices may only be mounted on/removed from the TBUS connector when the power is switched off.

When using the TBUS DIN rail connector (Order No. 2707437) for INTERFACE system communication and/or the voltage supply of the individual modules, connect together the required number of TBUS connectors (A) and push them onto the DIN rail (B).

When attaching the module to the DIN rail, make sure that it is aligned correctly with the TBUS connector (D).

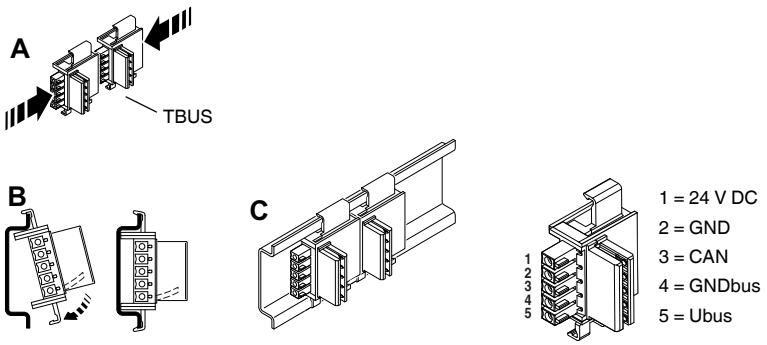


Figure 5-1 TBUS DIN rail connector

The voltage supply can be provided at the device or using the system power supply via the TBUS connector. The voltage supply can be provided at any EMM device, fieldbus module or using the system power supply via the TBUS connector.

A connection can be established between two DIN rail connectors using MINI COMBICON connectors: MC 1,5/5-ST-3,81 (female connector, 1803604); IMC 1,5/5-ST-3,81 (male connector, 1857919). The maximum cable length is 10 m. Use shielded cables.

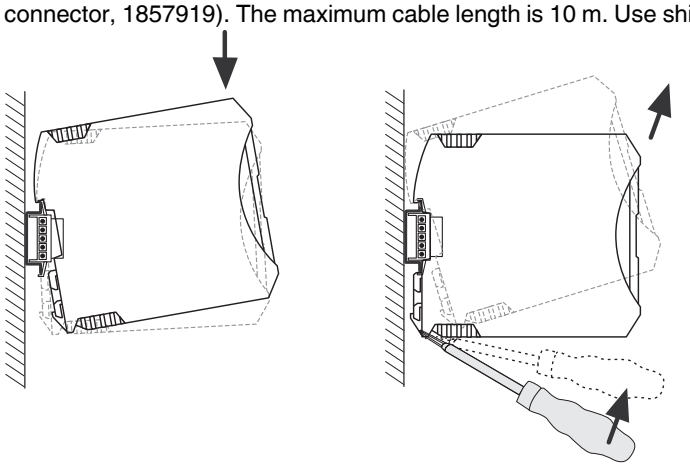


Figure 5-2 Mounting/removal

5.1 Technical data

TBUS DIN rail connectors	2707437
General data	
Housing material	Polyamide PA
Insulation material group	I
Surge voltage category	III
Pollution degree	3
Rated voltage	125 V
Impulse voltage withstand level	2.5 kV
Maximum load current	8 A
Dimensions (width x height x depth)	30 mm x 20 mm x 37 mm
Weight	5 g, approximately

6 Current transformer selection guide

This selection guide can be used to find a suitable current transformer for EMM... electronic motor management modules from Phoenix Contact.

The tables refer to current transformers in the PACT MCR range from Phoenix Contact. You can also use current transformers from other manufacturers, which meet the requirements described:

Table 6-1 Basic current transformer requirements

Requirement	Value
Surge withstand capability	6 kV
Primary voltage	1000 V
Surge voltage category	III
Standard	EN 50178, IEC 60044-1
Transducer type	Linear measuring transducer
Temperature range	-25°C ... +70°C
Transformation ratio	$TR = \frac{I_{pn}}{I_{sn}}$
Primary rated current I_{pn}	Application-specific
Secondary rated current I_{sn}	5 A
EMM internal resistance	0.02 Ω
Sum of system errors	EMM errors + Transformer errors
Transformer class	1

Example:

Motor type 132

Nominal motor current at 380/400 V AC = 11.5 A

When using **Ex e motors**, the transformer must be able to measure 8 times the nominal motor current, therefore an 80 A transformer must be used (e.g., PACT MCR...80).

Motor protection is implemented using the electronically simulated bimetal function of the EMM..... Current transformers can process up to 120% of the primary nominal current.

When using standard motors, i.e., **non-Ex e motors**, a 50 A transformer can be used, through which the primary conductor can be passed four times.

Motor protection is implemented using the motor management of the EMM....

6.1 Three-phase induction motor at a rotational frequency of 3000 rpm

						Motor protection using the electronic bimetal function for Ex e motors and non-Ex e motors		Motor protection using motor management for non-Ex e motors	
EMM...-IFS	EMM...16-IFS	Motor type	Motor power	Nominal motor current at 380/400 V	Nominal motor current at 500 V	Current transformer at 380/400 V	Current transformer at 500 V	Current transformer at 380/400 V (4 Durchf. means that the conductor is passed through the transformer 4 times)	Current transformer at 500 V (4 Durchf. means that the conductor is passed through the transformer 4 times)
			P [kW]	I_N [A]	I_N [A]				
	✓	**71**	0.55	1.36	1.03				
	✓	**80**	0.75	1.86	1.42				
	✓	**80**	1.1	2.65	2.0				
	✓	**90**	1.5	3.4	2.6				
	✓	**90**	2.2	4.9	3.7				
	✓	**100**	3	6.3	4.8				
	✓	**112**	4	7.8	5.9				
✓	✓	**132**	5.5	11.5	8.7	PACT MCR... 80	PACT MCR... 60	PACT MCR... 50_4_Durchf.	PACT MCR... 50_5_Durchf.
✓	✓	**132**	7.5	15.7	12	PACT MCR...125	PACT MCR... 80	PACT MCR... 50_3_Durchf.	PACT MCR... 50_4_Durchf.
✓		**160**	11	22	16.9	PACT MCR...150	PACT MCR...125	PACT MCR... 50_2_Durchf.	PACT MCR... 50_3_Durchf.
✓		**160**	15	29.5	22.5	PACT MCR...200	PACT MCR...150	PACT MCR... 50	PACT MCR... 50_2_Durchf.
✓		**160**	18.5	35.5	27	PACT MCR...250	PACT MCR...200	PACT MCR... 50	PACT MCR... 50_2_Durchf.
✓		**180**	22	42.5	32.5	PACT MCR...300	PACT MCR...250	PACT MCR... 50	PACT MCR... 50
✓		**200**	30	56	43	PACT MCR...400	PACT MCR...300	PACT MCR... 60	PACT MCR... 50
✓		**200**	37	70	53	PACT MCR...500	PACT MCR...400	PACT MCR... 75	PACT MCR... 50
✓		**225**	45	83	63	PACT MCR...600	PACT MCR...500	PACT MCR...100	PACT MCR... 75
✓		**250**	55	102	78	PACT MCR...750	PACT MCR...600	PACT MCR...100	PACT MCR... 75
✓		**280**	75	136	103	PACT MCR...1000	PACT MCR...750	PACT MCR...150	PACT MCR...100
✓		**280**	90	162	123	PACT MCR...1250	PACT MCR...1000	PACT MCR...200	PACT MCR...125
✓		**315**	110	198	150	PACT MCR...1500	PACT MCR...1000	PACT MCR...200	PACT MCR...150
✓		**315**	132	240	182	PACT MCR...1600	PACT MCR...1250	PACT MCR...250	PACT MCR...200
✓		**315**	160	285	217	PACT MCR...2000	PACT MCR...1500	PACT MCR...300	PACT MCR...250

6.2 Three-phase induction motor at a rotational frequency of 1500 rpm

						Motor protection using the electronic bimetal function for Ex e motors and non-Ex e motors		Motor protection using motor management for non-Ex e motors	
EMM...-IFS	EMM...16-IFS	Motor type	Motor power	Nominal motor current at 380/400 V	Nominal motor current at 500 V	Current transformer at 380/400 V	Current transformer at 500 V	Current transformer at 380/400 V (4 Durchf. means that the conductor is passed through the transformer 4 times)	Current transformer at 500 V (4 Durchf. means that the conductor is passed through the transformer 4 times)
			P [kW]	I_N [A]	I_N [A]				
	✓	71	0.37	1.14	-				
	✓	80	0.55	1.55	1.18				
	✓	80	0.75	1.95	1.48				
	✓	90	1.1	2.75	2.1				
	✓	90	1.5	3.6	2.75				
	✓	100	2.2	5.1	3.9				
	✓	112	3	7.3	5.6				
	✓	132	4	8.6	6.6				
✓	✓	132	5.5	11.4	8.7	PACT MCR... 80	PACT MCR... 60	PACT MCR... 50_4_Durchf.	PACT MCR... 50_5_Durchf.
✓		160	7.5	15.5	11.8	PACT MCR...125	PACT MCR... 80	PACT MCR... 50_3_Durchf.	PACT MCR... 50_4_Durchf.
✓		160	11	22.5	17.1	PACT MCR...150	PACT MCR...125	PACT MCR... 50_2_Durchf.	PACT MCR... 50_3_Durchf.
✓		160	15	30	23	PACT MCR...200	PACT MCR...200	PACT MCR... 50	PACT MCR... 50_2_Durchf.
✓		180	18.5	37	28	PACT MCR...250	PACT MCR...200	PACT MCR... 50	PACT MCR... 50
✓		200	22	43	32.5	PACT MCR...300	PACT MCR...250	PACT MCR... 50	PACT MCR... 50
✓		200	30	58	43.5	PACT MCR...400	PACT MCR...300	PACT MCR... 60	PACT MCR... 50
✓		225	37	72	54.5	PACT MCR...500	PACT MCR...400	PACT MCR... 75	PACT MCR... 60
✓		250	45	85	65	PACT MCR...600	PACT MCR...500	PACT MCR...100	PACT MCR... 75
✓		280	55	103	78	PACT MCR...750	PACT MCR...600	PACT MCR...100	PACT MCR... 80
✓		280	75	146	111	PACT MCR...1000	PACT MCR...750	PACT MCR...150	PACT MCR...125
✓		315	90	173	132	PACT MCR...1250	PACT MCR...1000	PACT MCR...200	PACT MCR...150
✓		315	110	198	150	PACT MCR...1500	PACT MCR...1000	PACT MCR...200	PACT MCR...150
✓		315	132	235	179	PACT MCR...1600	PACT MCR...1250	PACT MCR...250	PACT MCR...200

6.3 Three-phase induction motor at a rotational frequency of 1000 rpm

						Motor protection using the electronic bimetal function for Ex e motors and non-Ex e motors		Motor protection using motor management for non-Ex e motors	
EMM...-IFS	EMM...16-IFS	Motor type	Motor power	Nominal motor current at 380/400 V	Nominal motor current at 500 V	Current transformer at 380/400 V	Current transformer at 500 V	Current transformer at 380/400 V (4 Durchf. means that the conductor is passed through the transformer 4 times)	Current transformer at 500 V (4 Durchf. means that the conductor is passed through the transformer 4 times)
			P [kW]	I_N [A]	I_N [A]				
	✓	80	0.37	1.2	-				
	✓	80	0.55	1.8	1.35				
	✓	90	0.75	2.4	1.8				
	✓	90	1.1	3.4	2.55				
	✓	100	1.5	4.5	3.4				
	✓	112	2.2	5.8	4.4				
	✓	132	3	6.8	5.2				
	✓	132	4	9.3	7				
✓	✓	132	5.5	12.4	9.4	PACT MCR...100	PACT MCR... 75	PACT MCR... 50_4_Durchf.	PACT MCR... 50_5_Durchf.
✓		160	7.5	16.3	12.4	PACT MCR...125	PACT MCR...100	PACT MCR... 50_3_Durchf.	PACT MCR... 50_4_Durchf.
✓		160	11	23.5	17.8	PACT MCR...200	PACT MCR...125	PACT MCR... 50_2_Durchf.	PACT MCR... 50_2_Durchf.
✓		180	15	31	23.5	PACT MCR...250	PACT MCR...200	PACT MCR... 50	PACT MCR... 50_2_Durchf.
✓		200	18.5	37.5	28.5	PACT MCR...250	PACT MCR...200	PACT MCR... 50	PACT MCR... 50
✓		200	22	45	34	PACT MCR...300	PACT MCR...250	PACT MCR... 50	PACT MCR... 50
✓		225	30	61	46.5	PACT MCR...500	PACT MCR...400	PACT MCR... 60	PACT MCR... 50
✓		250	37	77	59	PACT MCR...600	PACT MCR...400	PACT MCR... 75	PACT MCR... 60
✓		280	45	84	64	PACT MCR...600	PACT MCR...500	PACT MCR...100	PACT MCR... 75
✓		280	55	102	78	PACT MCR...750	PACT MCR...600	PACT MCR...100	PACT MCR... 80
✓		315	75	146	111	PACT MCR...1000	PACT MCR...750	PACT MCR...150	PACT MCR...125
✓		315	90	174	132	PACT MCR...1250	PACT MCR...1000	PACT MCR...200	PACT MCR...150
✓		315	110	212	161	PACT MCR...1500	PACT MCR...1250	PACT MCR...250	PACT MCR...200

6.4 Three-phase induction motor at a rotational frequency of 750 rpm

						Motor protection using the electronic bimetal function for Ex e motors and non-Ex e motors		Motor protection using motor management for non-Ex e motors	
EMM...-IFS	EMM...16-IFS	Motor type	Motor power	Nominal motor current at 380/400 V	Nominal motor current at 500 V	Current transformer at 380/400 V	Current transformer at 500 V	Current transformer at 380/400 V (4 Durchf. means that the conductor is passed through the transformer 4 times)	Current transformer at 500 V (4 Durchf. means that the conductor is passed through the transformer 4 times)
			P [kW]	I_N [A]	I_N [A]				
	✓	80	0.25	1.0	-				
	✓	90	0.37	1.5	1.14				
	✓	90	0.55	2	1.54				
	✓	100	0.75	2.5	1.9				
	✓	100	1.1	3.45	2.6				
	✓	112	1.5	4.35	3.3				
	✓	132	2.2	5.9	4.5				
	✓	132	3	7.9	6				
✓	✓	160	4	9.7	7.4	PACT MCR... 75	PACT MCR... 50	PACT MCR... 50_5_Durchf.	PACT MCR... 50_6_Durchf.
✓	✓	160	5.5	13.6	10.3	PACT MCR...100	PACT MCR... 75	PACT MCR... 50_3_Durchf.	PACT MCR... 50_4_Durchf.
✓		160	7.5	18	13.6	PACT MCR...150	PACT MCR...100	PACT MCR... 50_2_Durchf.	PACT MCR... 50_3_Durchf.
✓		180	11	24	18.2	PACT MCR...200	PACT MCR...125	PACT MCR... 50_2_Durchf.	PACT MCR... 50_2_Durchf.
✓		200	15	32.5	24.5	PACT MCR...250	PACT MCR...200	PACT MCR... 50	PACT MCR... 50_2_Durchf.
✓		225	18.5	41.5	31.5	PACT MCR...300	PACT MCR...250	PACT MCR... 50	PACT MCR... 50
✓		225	22	48.5	37	PACT MCR...400	PACT MCR...250	PACT MCR... 50	PACT MCR... 50
✓		250	30	63	48	PACT MCR...500	PACT MCR...400	PACT MCR... 75	PACT MCR... 50
✓		280	37	75	57	PACT MCR...500	PACT MCR...400	PACT MCR... 75	PACT MCR... 60
✓		280	45	95	72	PACT MCR...700	PACT MCR...500	PACT MCR...100	PACT MCR... 75
✓		315	55	109	83	PACT MCR...800	PACT MCR...600	PACT MCR...125	PACT MCR... 80
✓		315	75	151	115	PACT MCR...1250	PACT MCR...800	PACT MCR...150	PACT MCR...125
✓		315	90	181	138	PACT MCR...1250	PACT MCR...1000	PACT MCR...200	PACT MCR...150

6.5 Recommended restart time

Recommended restart time following bimetal response when using Ex e motors:

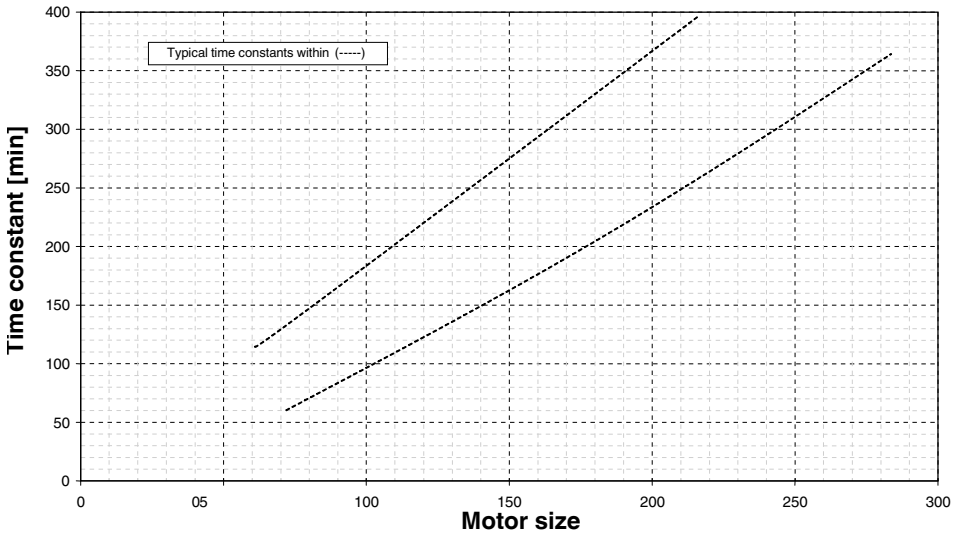


Figure 6-1 Recommended restart time

A restart time of 120 minutes can be achieved with the CONTACTRON-DTM-IFS.

7 CONTACTRON-DTM-IFS device drivers

The DTM (Device Type Manager) comprises all functions, the structure, the parameterization, and the GUI (graphical user interface) including a help system for a specific field device or device range. The DTM is installed on the PC as a program, but can only be started from a container or the frame application, e.g., IFS-Conf.

In addition to the device DTMs, there are also DTMs for communication devices, such as PROFIBUS DP controller boards, HART modems or gateway devices.

The devices in the CONTACTRON EMM... product range (electronic motor management) product range from Phoenix Contact can be used to switch, measure, warn, protect, monitor, and evaluate. The electronic management module offers all the familiar advantages of real power monitoring. Drives of any size are now started or reversed with separate contactors. In this way, not only the motor, but the complete system is reliably protected against damage resulting from overload or underload.

All communication for parameterization, operation, and monitoring is also possible in online mode via PROFIBUS DP V1. The bus device is simply integrated in the control system via the DTM.

The Phoenix Contact CONTACTRON-DTM-IFS can also be integrated in other FDT containers, such as:

- PACTware
- FieldCare from Endress+Hauser
- fdtCONTAINER from M&M
- SmartVision from ABB

7.1 System requirements

7.1.1 Supported operating systems

– MS Windows 2000 with Service Pack 4
– MS Windows XP
– MS Windows Vista
– MS Windows 7

7.1.2 Hardware requirements

Hardware requirements		
CPU	Pentium III, 1 GHz (2 GHz recommended)	
Main memory	1 GB (minimum), 2 GB (recommended)	Windows Vista, Windows 7
	512 MB (minimum), 1 GB (recommended)	Windows XP, Windows 2000 SP4
Hard disk space	500 MB free memory space	
CD-ROM drive	Yes	
Interfaces	1 x USB 2.0	
Monitor	SVGA, resolution of 1024 x 768 pixels (minimum); SXGA, resolution of 1280 x 1024 pixels (recommended)	
Operating devices	Keyboard, mouse	

7.1.3 Software requirements

Software requirements for CONTACTRON motor management	
.Net Framework	Version 1.1
.Net Framework	Version 1.1 SP1
.Net Framework	Version 2.0
Windows Installer	Version 3.1
Internet browser	MS Internet Explorer Version 6.0 or later Mozilla Firefox Version 3.5 or later

Designation	Description
FDT container	IFS-Conf AutomationXplorer+
CONTACTRON-DTM-IFS	DTM devices for integrating the EMM module in the FDT container

7.1.4 Programming adapter

Designation	Description	Order No.
IFS-USB-PROG-ADAPTER	Programming adapter for configuring Phoenix Contact INTERFACE modules with 12-pos. S-PORT interface	2811271

7.1.5 Configuration package

Designation	Description	Order No.
MM-CONF-SET	The configuration package contains the following components: CONTACTRON-DTM-IFS IFS-USB-PROG-ADAPTER	2297992

7.2 Connecting the programming adapter

The IFS-USB-PROG-ADAPTER programming adapter (Order No. 2811271) is used to configure Phoenix Contact INTERFACE modules with 12-pos. S-PORT interface.

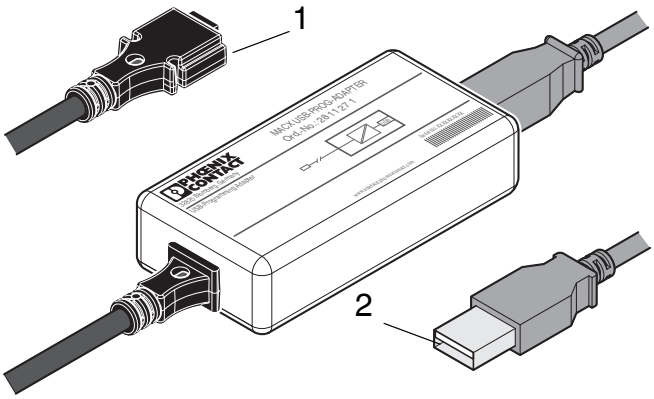


Figure 7-1 IFS-USB-PROG-ADAPTER

1 S-PORT connector
2 USB connector

7.2.1 Connection notes

WARNING: Risk of injury
The programming adapter must not be used in potentially explosive areas.
Do not use the programming adapter if you suspect that it is damaged.

The adapter may only be used to program supported Phoenix Contact INTERFACE devices. Check the documentation for your device to see whether the programming adapter is compatible.

You must install the configuration software required for your device prior to initial startup. Observe the relevant device documentation for this purpose.

7.2.2 Connection to the PC

Connect the programming adapter to a free USB connection on your PC using the USB cable provided.

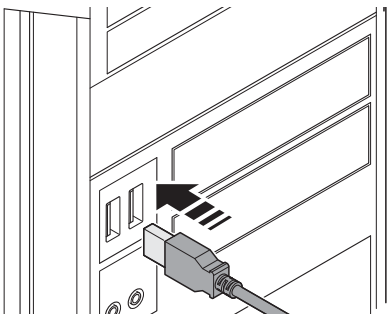


Figure 7-2 Connection to the PC

7.2.3 Connection to the device

On the device, connect the programming adapter to the 12-pos. S-PORT interface.

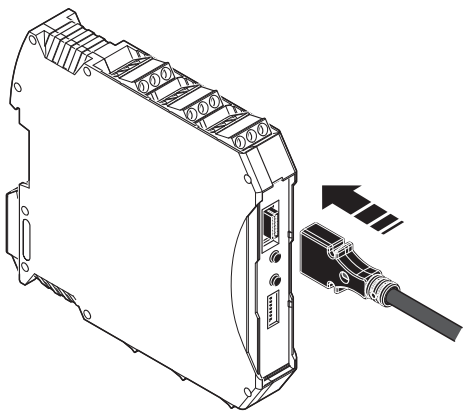


Figure 7-3 Connection to the device

NOTE: Potential damage to cables

Position the programming adapter so that no strain is placed on the plug-in connection on the device.

7.2.4 Technical data

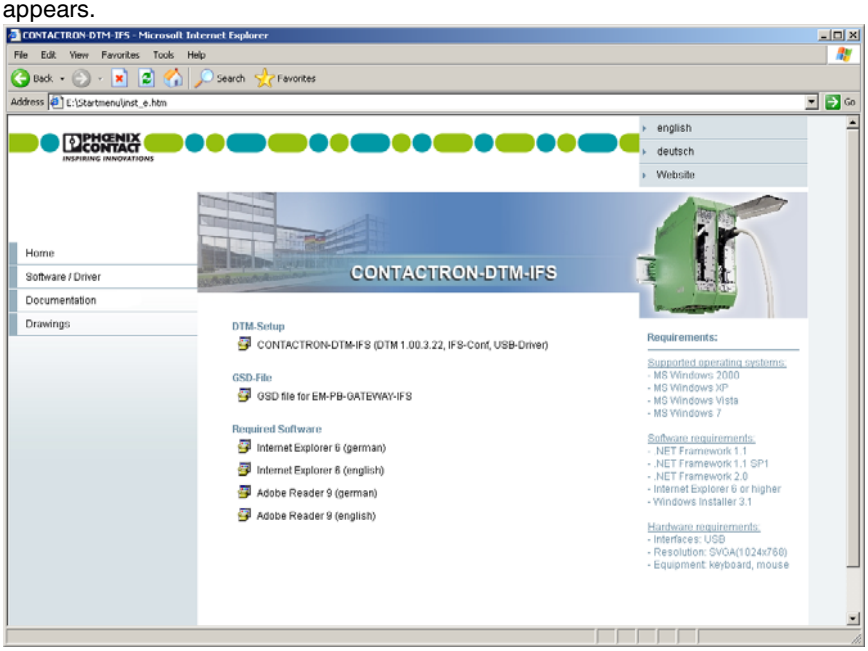
IFS-USB-PROG-ADAPTER	2811271
Connections	
PC side (serial)	USB 2.0 full-speed
Measuring transducer side	S-PORT
General data	
Housing material	ABS
Dimensions (width x height x depth) (without cable)	40 mm x 20 mm x 80 mm
Weight	140 g, approximately
Ambient conditions	
Ambient temperature (operation)	-20°C … +65°C, -4°F ... +149°F
Ambient temperature (storage/transport)	-40°C … +85°C, -40°F ... +185°F
Humidity, no condensation	90% (25°C)
Conformance with EMC Directive 2004/108/EC	
Noise immunity according to EN 61000-6-2	
Noise emission according to EN 61000-6-4	

7.3 Software setup

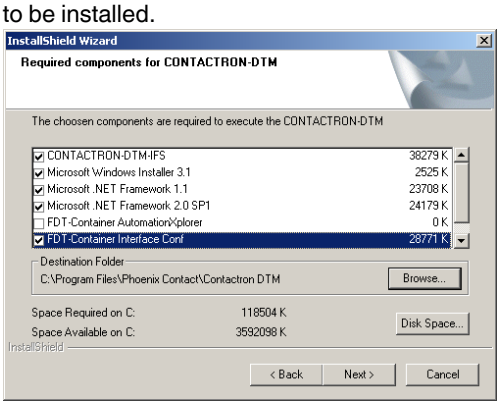
7.3.1 Installation

To install the CONTACTRON-DTM-IFS software, proceed as follows:

1. Insert the "CONTACTRON-DTM-IFS" CD in your CD-ROM drive.
   The installation user interface starts automatically.
2. If it does not, start the "start.htm" file from the "[Drive]:" directory on the CD-ROM.
3. Select the "Software/Driver" item from the menu bar on the left. The DTM setup page appears.



4. Select the "CONTACTRON-DTM-IFS (DTM <Version>, IFS-Conf, USB-Driver)" file.
   This calls the installation wizard, which guides you through the installation process.
5. Follow the instructions in the installation program until it comes to selecting the software to be installed.



Here you can decide whether you wish to use AutomationXplorer+ or IFS-Conf.

DTMs from various manufacturers can be integrated in AutomationXplorer+. Only Phoenix Contact DTMs can be integrated in IFS-Conf.

IFS-Conf is used in all the following descriptions.

6. Confirm the dialog box with "Next".
7. Follow the instructions in the installation program. The installation program generates all the directories required for operation and copies the necessary files.
8. You must restart your PC for the changes to the configuration files to take effect. To do this, click on "Finish" at the end of the installation process.

7.3.2 Uninstallation

To uninstall IFS-Conf, proceed as follows:

1. Open the Start menu.
2. Open the "Settings" menu.
3. Open the Control Panel.
4. Open the "Software" module.
5. Select the "IFS-Conf" entry in the list box.
6. Click on "Add/Remove".
7. Follow the on-screen instructions.

7.3.3 Configuration

Knowledge of handling and operating the IFS-Conf user interface is required at this point. For more detailed information about IFS-Conf, please refer to the online help.

7.3.3.1 Creating a user

When IFS-Conf is started for the first time, you need to create a user.

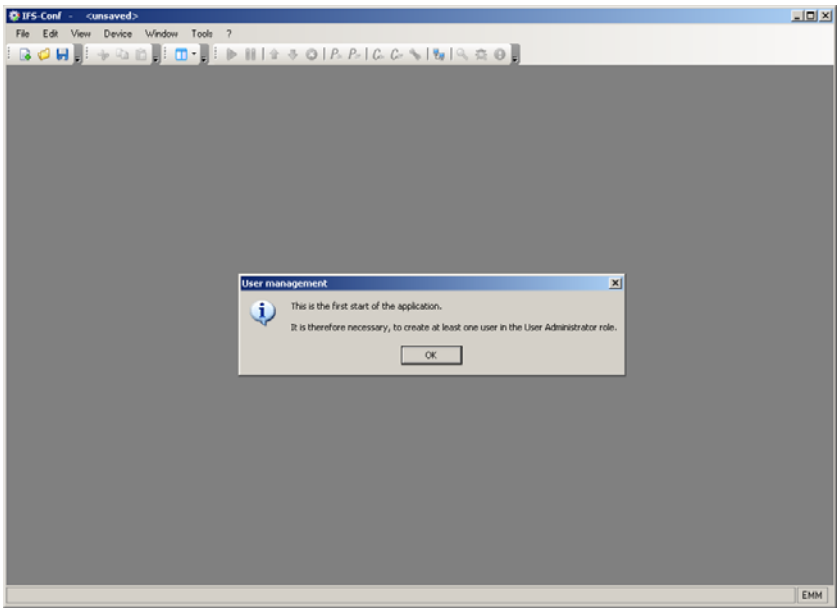


Figure 7-4 Starting the application for the first time

In the following example, an administrator with the name "EMM" is created.

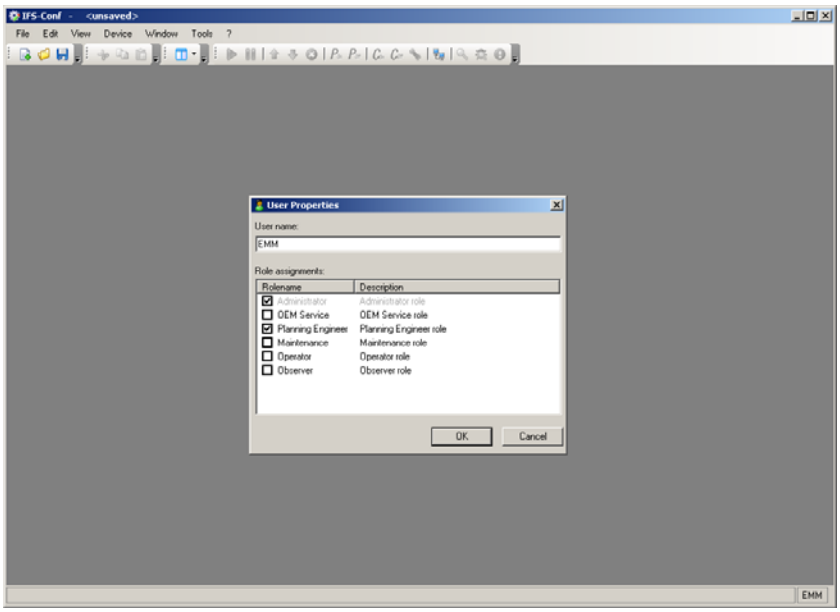


Figure 7-5 Creating a user

7.3.3.2 Transferring the CONTACTRON-DTM-IFS to catalog management

After you have created the user, catalog management opens automatically.

Searching for the CONTACTRON-DTM-IFS

1. Click on "Search for installed DTMs".
   The DTM catalog management update process is displayed in a progress indicator.

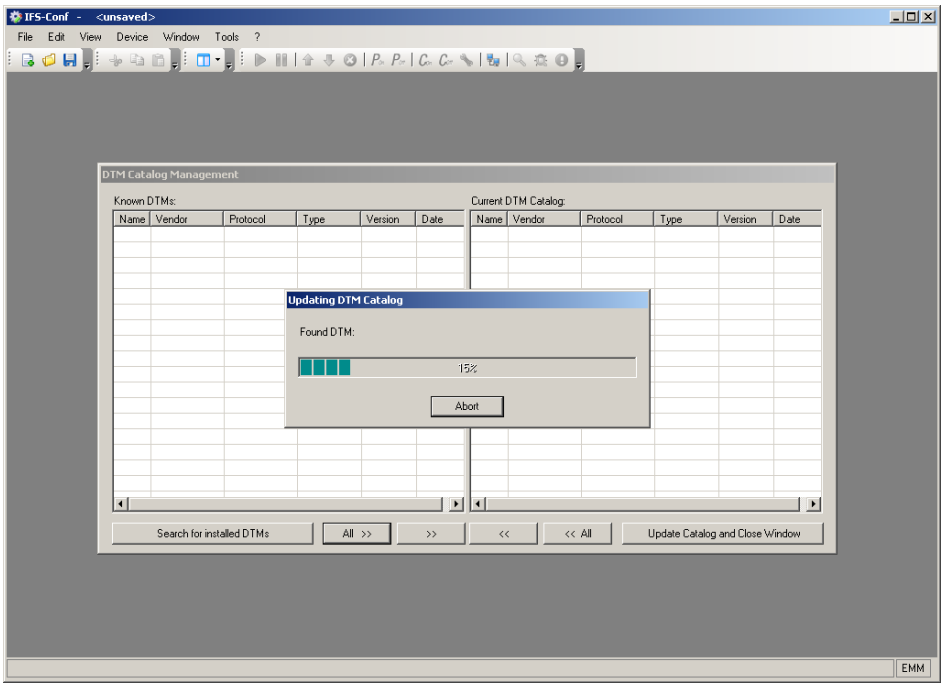


Figure 7-6 Searching for installed DTMs

Transferring the CONTACTRON-DTM-IFS

The DTMs entered in the registry are displayed under "Known DTMs".

Transfer the CONTACTRON-DTM-IFS from the selection table to the current DTM catalog. To do this, proceed as follows:

2. Select the CONTACTRON-DTM-IFS or several DTMs simultaneously and click on the ">>" button or transfer all the DTMs by clicking on "All >>".

The CONTACTRON-DTM-IFS is now transferred to the current DTM catalog of IFS-Conf. If you want to transfer additional DTMs at a later time, follow the same procedure.

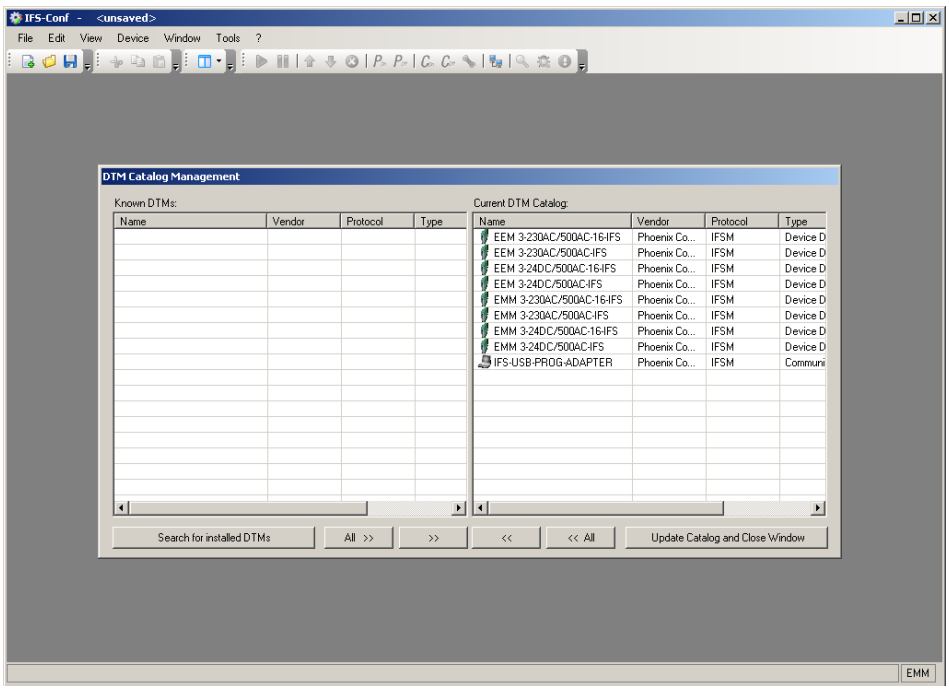


Figure 7-7 DTM catalog management

Closing catalog management

3. Click on "Update Catalog and Close Window".
   Catalog management is closed.

7.3.3.3 Connecting devices

Topology scan

When catalog management is closed, the Topology Scan Wizard starts automatically and searches for connected devices.

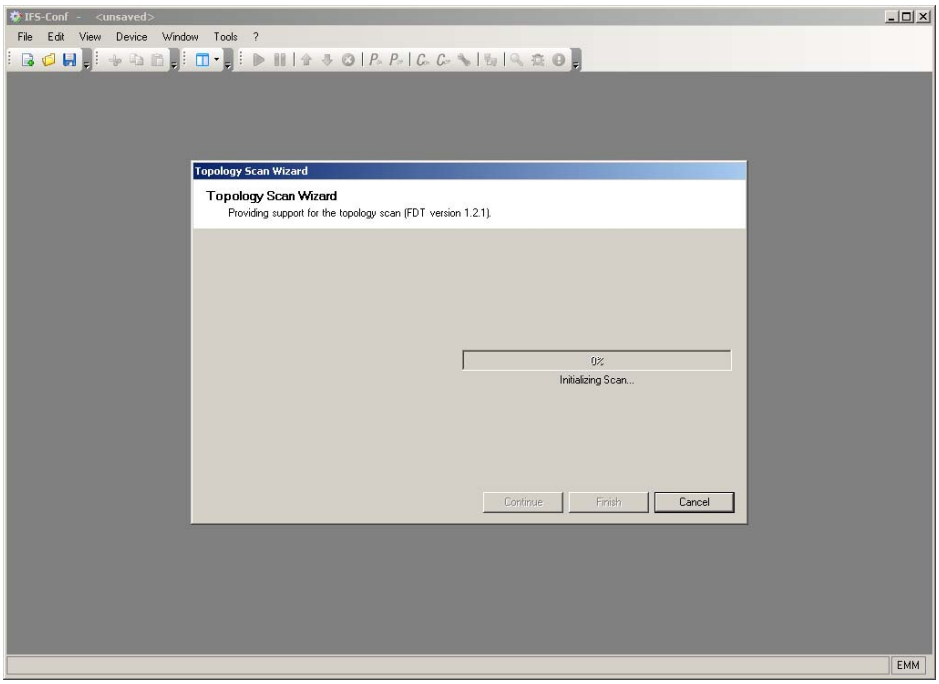


Figure 7-8 Topology Scan Wizard

Establishing a connection

When a device is found, the connection is established automatically and the "Observe" dialog box is opened.

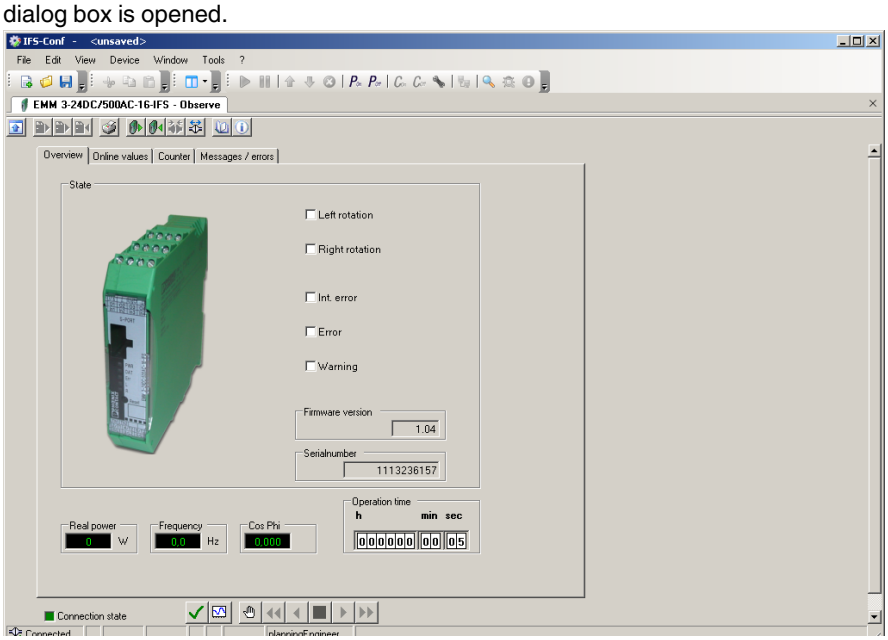


Figure 7-9 "Observe" dialog box

If no device is connected, an error message is displayed.

To manually add a device to the project, proceed as follows:

1. Show the project tree via the "View, Project Tree" menu.
2. Show the DTM catalog via the "View, DTM Catalog" menu.
3. Drag the required hardware from the "DTM Catalog" and drop it into the "Project Tree" or insert it by double-clicking.

7.4 EMM 3- xx/500AC/xx-IFS module parameter menu

The operating behavior of the EMM 3- xx/500AC/xx-IFS module is adapted by means of the individual parameters that can be set. In the dialog boxes illustrated below, the parameters can be set according to the required application and transmitted to the EMM 3- xx/500AC/xx-IFS.

Parameters that are not edited are always preassigned the default settings on the program side.

Parameters that are modified in online mode must be saved separately on the service PC.

7.4.1 User interface

The parameter data of the EMM 3- xx/500AC/xx-IFS module can be accessed via a menu structure from the parameter user interface. The project data can either be loaded and modified in XML data format from the hard disk of the service PC or adapted directly in online mode.

An activated online connection to a EMM 3- xx/500AC/xx-IFS module is indicated by the green background in the project tree of IFS-Conf.

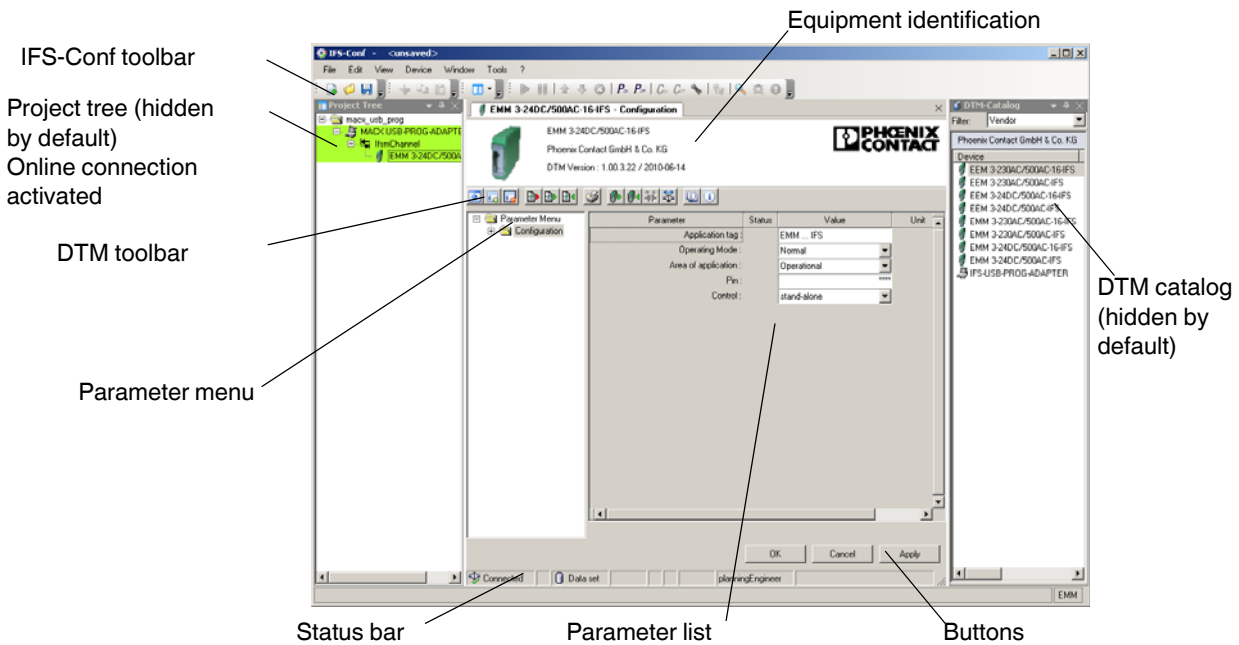


Figure 7-10 Activated online connection to the EMM 3- xx/500AC/xx-IFS module

7.4.2 Buttons in the IFS-Conf toolbar

The toolbar comprises various buttons that enable quicker access to frequently used functions.

Icon	Meaning	Description
	Create new project	An empty project is created.
	Open project	A previously saved project is opened.
	Save project	The project that is currently open is saved.
	Establish connection to device	A connection is established to the device selected in the project tree.
	Disconnect connection to device	The connection to the device selected in the project tree is disconnected.
	Upload parameters from device	All parameters are loaded from the device into the project.
	Download parameters to device	All parameters are written to the device.
	Abort last action	The last action is aborted.
	Online parameters	The online parameters dialog box is opened.
	Offline parameters	The offline parameters dialog box is opened.
	Online comparison	No function
	Offline comparison	No function
	Settings...	The settings dialog box is opened.
	Scan topology...	A topology scan is started.
	Monitor...	The monitoring dialog box is opened.
	Diagnostics...	No function
	Info	No function

7.4.3 Buttons in the DTM toolbar

The toolbar comprises various buttons that enable quicker access to frequently used functions.

Icon	Meaning	Description
	Show/hide	Show/hide equipment identification for device identification
	Expand tree	Fully expand the parameter menu tree
	Collapse tree	Collapse the parameter menu tree
	Import default values	Load the default device configuration in the project
	Import	Load a saved device configuration in the project
	Export	Save the device configuration that is currently open to an XML file
	Print	Open a clearly laid out version of the device configuration that is currently open for printing
	Read from device	Read device configuration from the connected device and transfer it to the project that is currently open
	Write to device	Write the device configuration that is currently open to the connected device
	Connect	Establish a connection to the connected device
	Disconnect	Disconnect the connection to the connected device
	User manual	Opens the user manual (PDF file)
	About this DTM	Opens an information dialog box with information about the installed DTM

In the event of technical queries regarding the parameterization of the EMM 3- xx/500AC/xx-IFS module, please have the details of the DTM used to hand ("About this DTM" button).

7.4.4 Status bar

The status bar displays brief help text about the menus and icons as well as the status of the connection to the device.

7.4.4.1 Icons – General

Icon	Meaning	Description
	Modification valid	Modifications to the parameter settings are valid
	Modification invalid	Modifications to the parameter settings are invalid. The entered value is not within the valid value range.
	Device reset	Device is reset
	Direct mode	Connection established between service PC and device
	Update values	Values are updated

7.4.4.2 Icons – Diagnostics

Icon	Meaning	Description
	Device error	Device error, e.g., faulty thermistor protection
	Function test	A function test is being carried out
	Value limits	Limits of the value range exceeded
	Maintenance required	Determined values are not consistent
	Device OK	Output signals are within the valid value range
	Diagnostics deactivated	Diagnostics deactivated

7.4.4.3 Icons – Connection

Icon	Meaning	Description
	Establish connection	Establishing service PC/device connection
	Connection present	Connection present between service PC and device
	Disconnect connection	Disconnect connection between service PC and device
	Connection disconnected	Connection between service PC and device disconnected
	Connection error	Connection between service PC and device is faulty

7.4.4.4 Icons – Data source

Icon	Meaning	Description
	Data	Data is being loaded from the device/service PC. Modified values are only transmitted to the device/service PC.
	Data protected	Data from the device/service PC cannot be modified.
	Data online	Data is being loaded online from the device/service PC. Modified values are only transmitted to the device/service PC.
	Access to the device disabled	Connection between service PC and device disconnected
	Data/device	The request contains values from various data sources, e.g., for use in online comparison (comparison of offline/online device data) Clear assignment between the devices and data is required.

7.4.5 Settings

The editing of a project involves the settings for a selected device. Clicking on the "Settings..." button in the IFS-Conf toolbar opens the "Settings" dialog box.

7.4.5.1 Configuration

On the first dialog page for configuring the EMM 3- xx/500AC/xx-IFS module, the general data for the device is entered. This data can be used for clear identification, for example, using system and location designations.

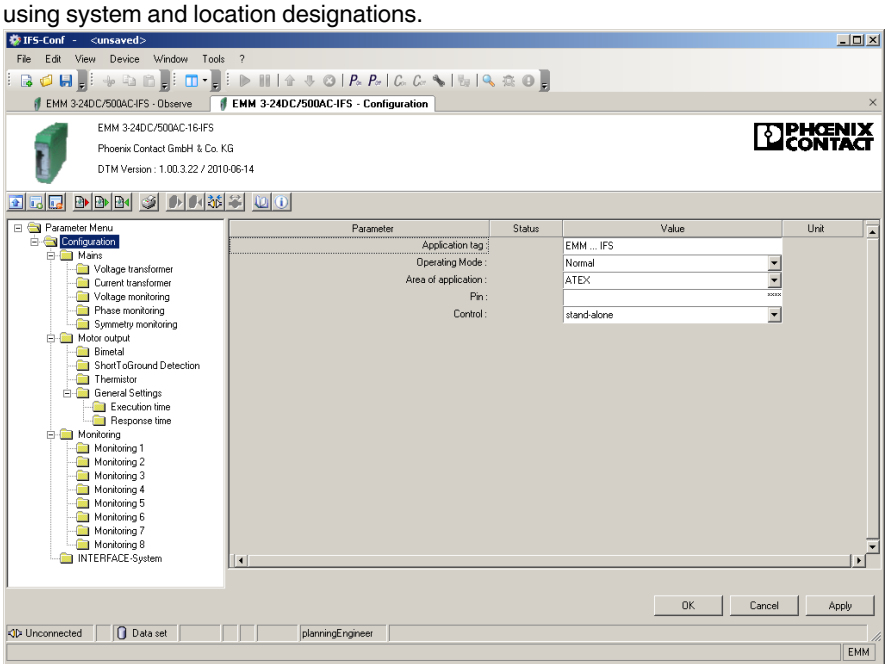


Figure 7-11 Overview of the general parameters

Parameter	Selection value	Interval	Program side
Application tag	– 32 characters, maximum	–	EMM...IFS
Operating Mode	– Normal – Test mode (cold operation)	–	Normal
Area of application	– Operational – ATEX	–	ATEX
Pin	– Min: 0 – Max: 9999	–	0000
Control	– Stand-alone – by IFS-Gateway	–	Stand-alone

Test mode (cold operation)
Control functions are executed without a connected load (e.g., a motor).

ATEX area of application
Some ATEX-specific values are modified automatically by clicking "OK". Therefore check the settings that have already been made.

Pin handling
In order to reset the PIN, write "0" once to the EMM…IFS.

Control
If the EMM is controlled via an IFS gateway you have to select "by IFS Gateway". Then input 3 at the EMM is used for activation of "on-site control" (see "Program side default setting of inputs and outputs" on page 7-28).

7.4.5.2 Voltage transformer

If a 690 V voltage transducer (Order No. 2901667) is used before the EMM ... 500AC-IFS, it must be activated here so that the measured values are calculated correctly.

This function is only supported by the following EMM relays:

- EMM 3- 24DC/500AC-IFS (Order No. 2297497)
- EMM 3-230AC/500AC-IFS (Order No. 2297507)

This menu item is not available for device types with integrated current transformers.

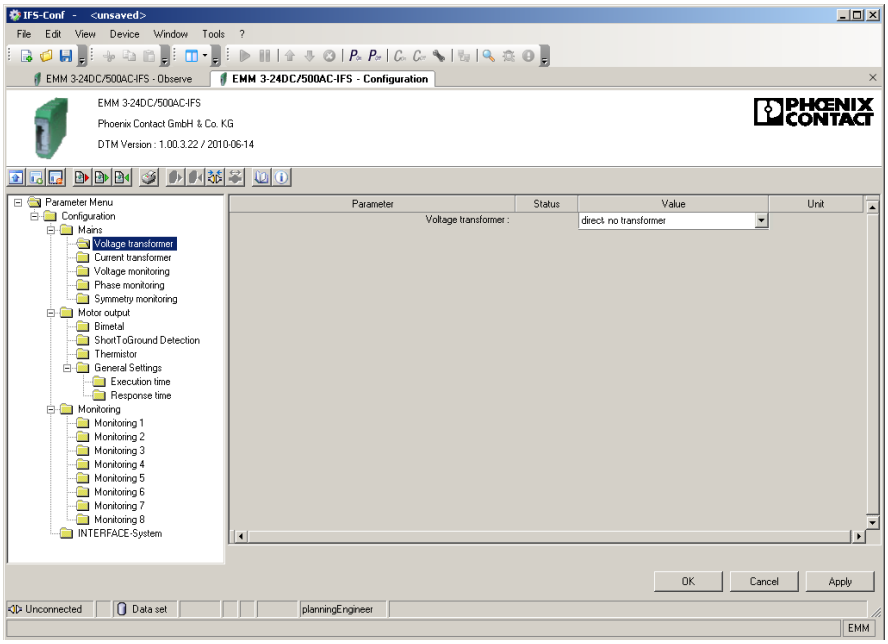


Figure 7-12 "Voltage transformer" configuration dialog box

The following parameter data can be set:

Parameter	Selection value	Interval	Program side
Voltage transformer	– direct, no transformer – 690 V AC (Order No. 2901667)	-	direct, no transformer

7.4.5.3 Current transformer

Depending on the device used, a current transformer can be connected directly for recording and transmitting the measured currents. Depending on the transformation ratio, the primary current is transmitted to a smaller electrically isolated secondary current.

This function is only supported by the following EMM relays:

- EMM 3- 24DC/500AC-IFS (Order No. 2297497)
- EMM 3-230AC/500AC-IFS (Order No. 2297507)

This menu item is not available for device types with integrated current transformers.

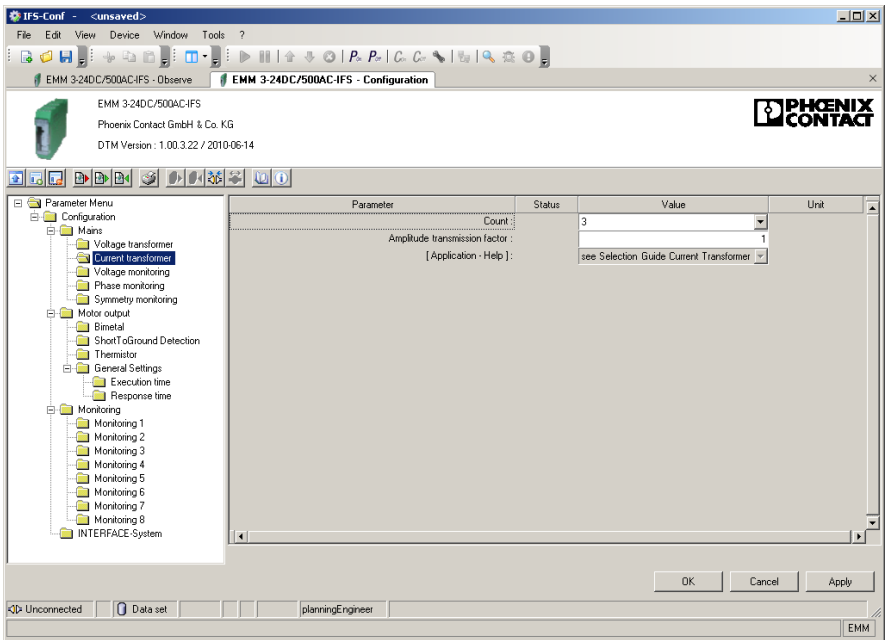


Figure 7-13 "Current transformer" configuration dialog box

The following parameter data can be set:

Parameter	Selection value	Interval	Program side
Count	– 1 – 3	–	3
Amplitude transmission factor	– Min: 1 – Max: 1000	0.01	1

"Current transformer selection guide" on page 6-1 contains an overview which you can use to find a suitable current transformer.

7.4.5.4 Voltage monitoring

The nominal voltage in low voltage networks is 230/400 V. Under normal operating conditions, the mains voltage can deviate from the nominal voltage by up to +/-10% at the transfer point. Momentary additional deviations also cannot be ruled out, neither can momentary mains failures. Nevertheless, to ensure safe operation, a mains regeneration time can be defined. To prevent possible damage to subsequent drives, the voltage monitoring parameters are set here.

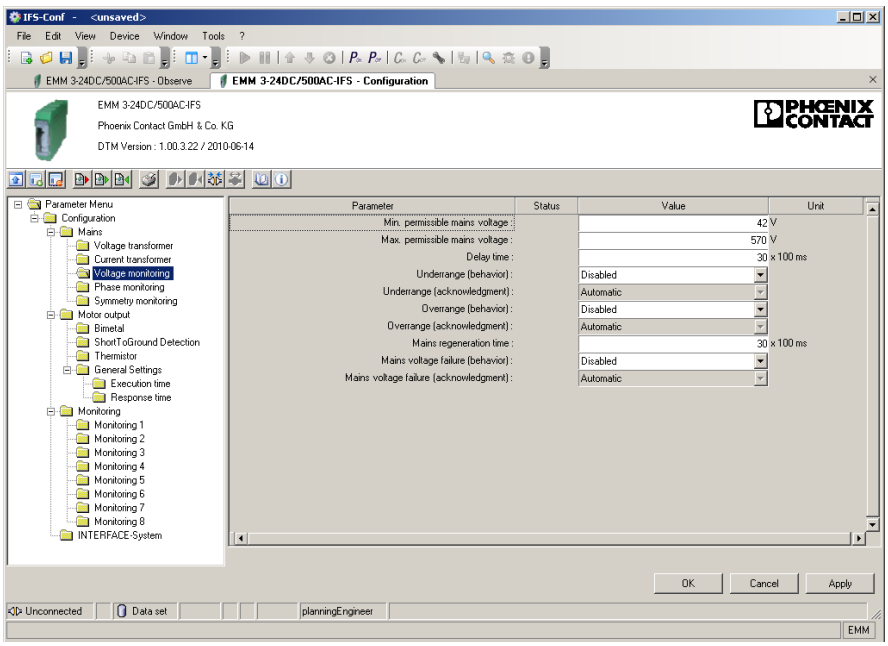


Figure 7-14 "Voltage monitoring" configuration dialog box

The following parameter data can be set:

Parameter	Selection value	Interval	Program side
Min. permissible mains voltage	– Min: 40 – Max: 575 (EMM ... 16-IFS) – Max: 759 (EMM ... IFS)	1	42
Max. permissible mains voltage	– Min: 40 – Max: 575 (EMM ... 16-IFS) – Max: 759 (EMM ... IFS)	1	570
Delay time	– Min: 0 – Max: 60000	1	30
Underrange (behavior)	– Disabled – Disable drive – Generate message	–	Disabled
Underrange (acknowledgment)	– Automatic – Manual	–	Automatic

Parameter	Selection value	Interval	Program side
Overrange (behavior)	– Disabled – Disable drive – Generate message	–	Disabled
Overrange (acknowledgment)	– Automatic – Manual	–	Automatic
Mains regeneration time	– Min: 0 – Max: 60000	1	30
Mains voltage failure (behavior)	– Disabled – Disable drive – Generate message	–	Disabled
Mains voltage failure (acknowledgment)	– Automatic – Manual	–	Automatic

7.4.5.5 Phase monitoring

To ensure correct operation of the drive, all three phases in a three-phase network must be available. To detect the failure of a phase, the corresponding parameters can be set here.

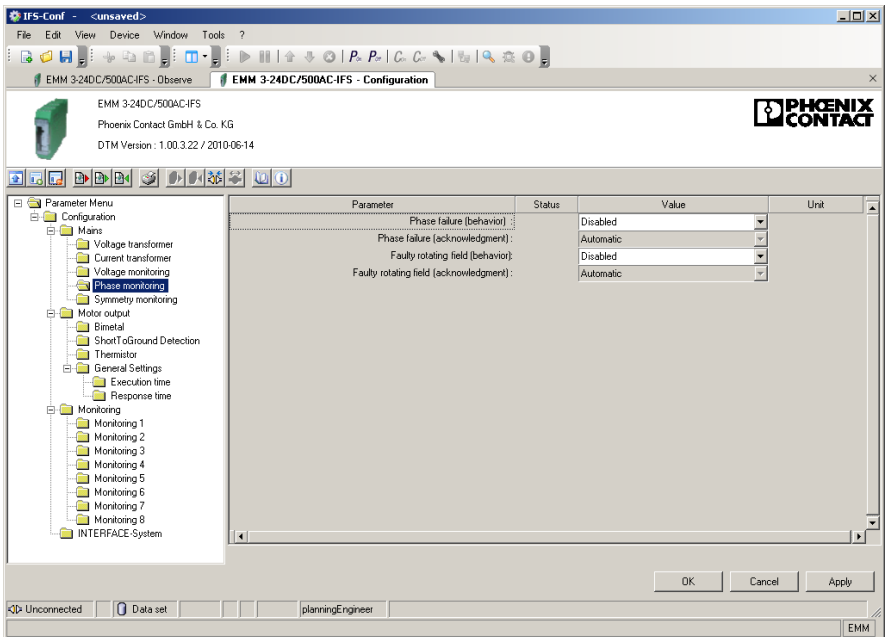


Figure 7-15 "Phase monitoring" configuration dialog box

The following parameter data can be set:

Parameter	Selection value	Interval	Program side
Phase failure (behavior)	– Disabled – Disable drive – Generate message	–	Disabled
Phase failure (acknowledgment)	– Automatic – Manual	–	Automatic
Faulty rotating field (behavior)	– Disabled – Disable drive – Generate message	–	Disabled
Faulty rotating field (acknowledgment)	– Automatic – Manual	–	Automatic

7.4.5.6 Symmetry monitoring

Deviations in voltage symmetry occur, e.g., due to uneven loads on the three conductors of the three-phase system when using powerful AC devices or due to the failure of one of the three voltages in the three-phase system. To prevent possible damage to subsequent drives, the symmetry monitoring parameters are set here.

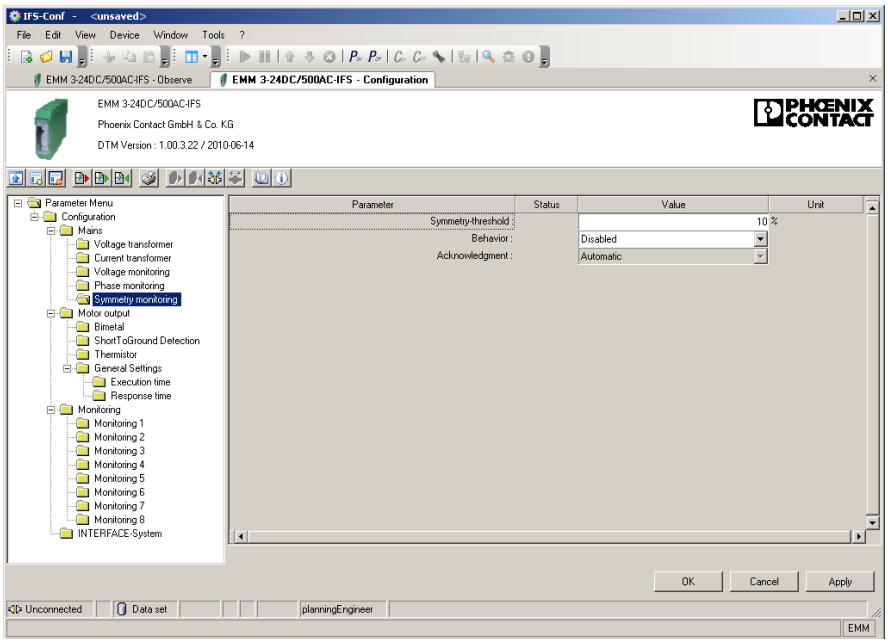


Figure 7-16 "Symmetry monitoring" configuration dialog box

The following parameter data can be set:

Parameter	Selection value	Interval	Program side
Symmetry-threshold	– Min: 3 – Max: 100	1	10
Behavior	– Disabled – Disable drive – Generate message	–	Disabled
Acknowledgment	– Automatic – Manual	–	Automatic

7.4.5.7 Motor output

To control motor outputs, various switching output types are available by default. To prevent possible damage to the motor outputs or drives, set the required switching output type here.

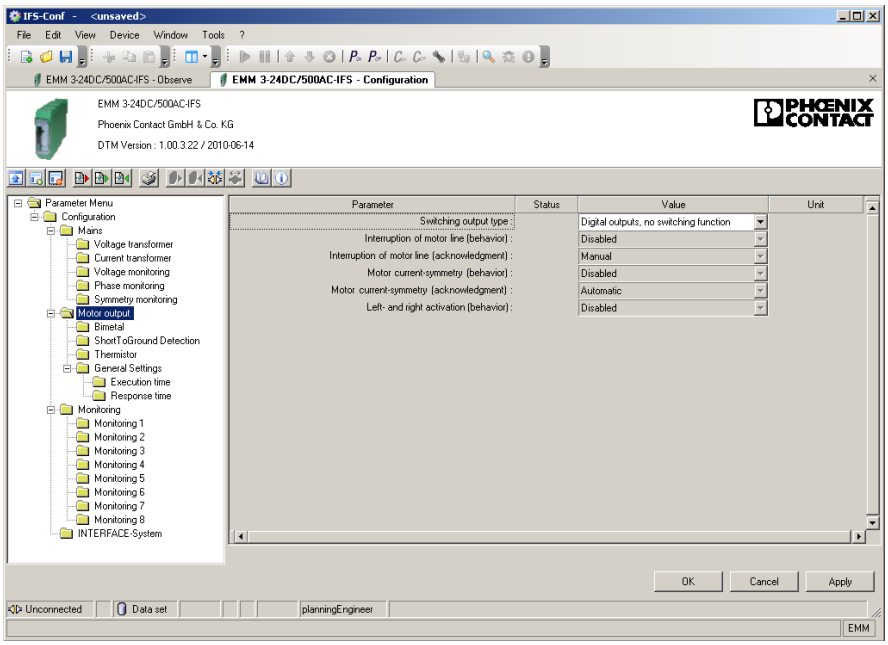


Figure 7-17 "Motor output" configuration dialog box

The following parameter data can be set:

Parameter	Selection value	Interval	Program side
Switching output type	– Digital outputs, no switching function – Direct starter – Reversing starter – Star/delta – Star/delta LR	–	Digital outputs, no switching function
Interruption of motor line (behavior)	– Disabled – Disable drive – Generate message	–	Disable drive
Interruption of motor line (acknowledgment)	– Manual	–	Manual
Motor current-symmetry (behavior)	– Disabled – Disable drive – Generate message	–	Disable drive
Motor current-symmetry (acknowledgment)	– Manual	–	Manual

Parameter	Selection value	Interval	Program side
Left- and right activation (behavior)	– Disabled – Disable drive – Generate message	–	Disabled

Program side default setting

The inputs and outputs are assigned automatically depending on the selection of the switching output type, e.g., digital outputs. The signal and function assignment is fixed. See also "Outputs 1 ... 8 - IFS" on page 7-48.

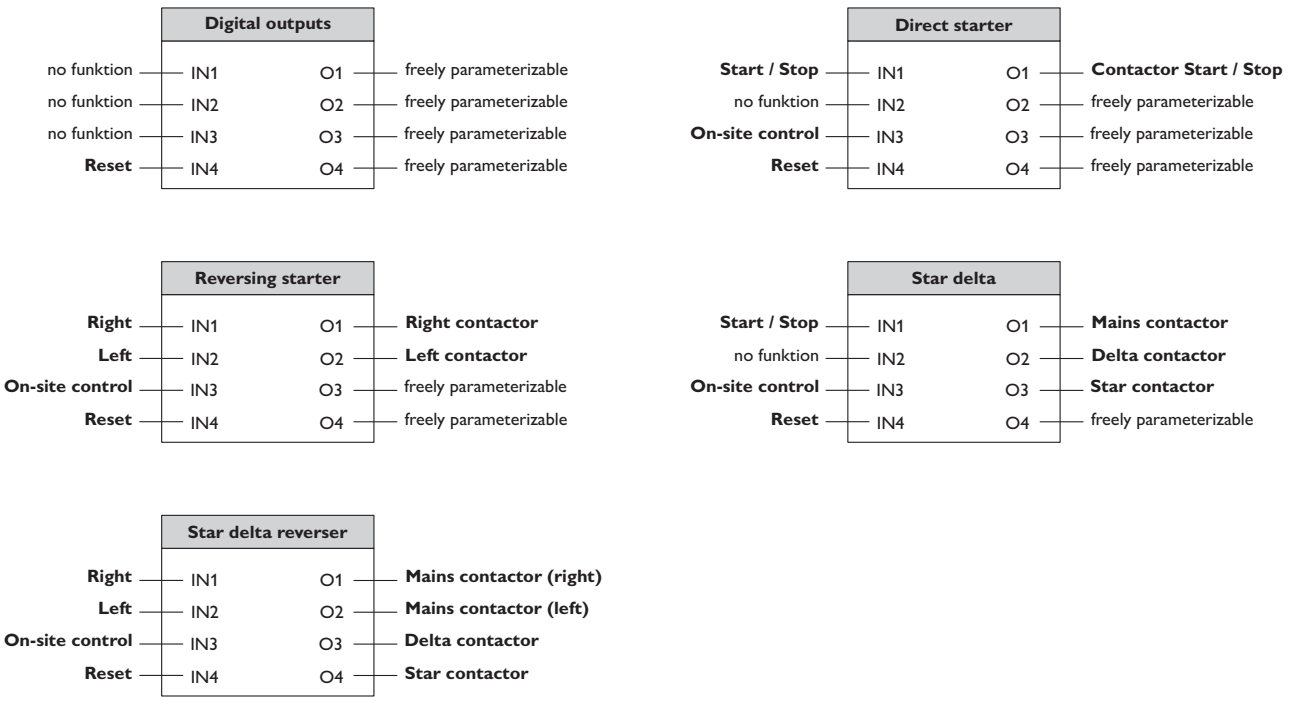


Figure 7-18 Program side default setting of inputs and outputs

If the EMM...IFS is connected to an EM-PB-GATEWAY-IFS (PROFIBUS), inputs 1 and 2 are blocked at the EMM and input 3 is used as the on-site control signal.

When input 3 is controlled, the signal from PROFIBUS is interrupted and inputs 1 and 2 are enabled at the EMM so that on-site control can be implemented directly at the EMM.

If the EMM...IFS is not connected to an EM-PB-GATEWAY-IFS, input 3 has no function.

7.4.5.8 Bimetal

To protect cables against thermal overload, the specified trigger characteristics can be used to preset the trigger behavior.

Blocking monitoring is activated with a motor current of 60 A or higher.

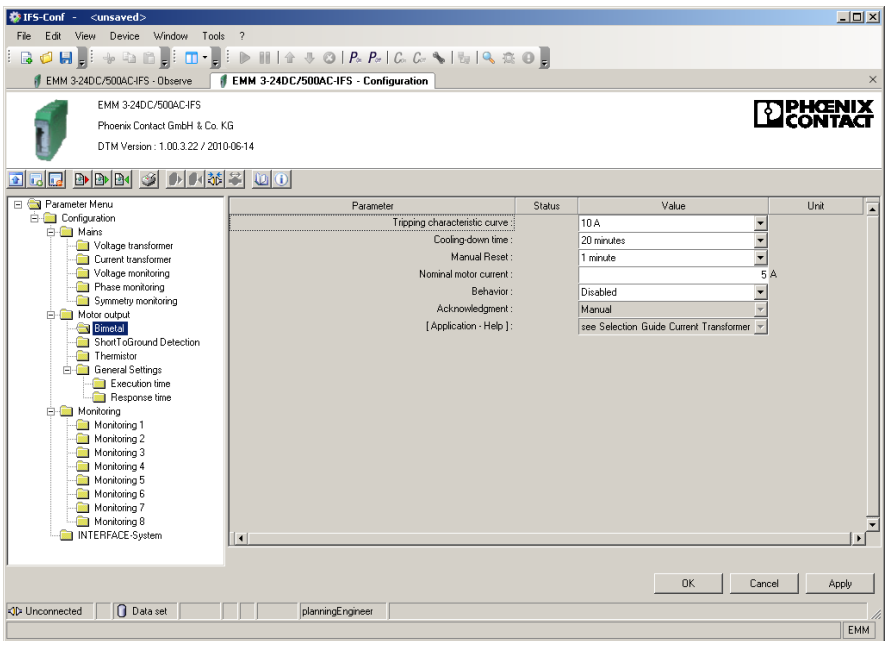


Figure 7-19 "Bimetal" configuration dialog box

The following parameter data can be set:

Parameter	Selection value	Interval	Program side
Tripping characteristic curve	5, 10 A, 10, 15, 20, 25, 30, 35, 40	–	10 A
Cooling-down time	2 minutes, 5 minutes, 10 minutes, 20 minutes, 30 minutes, 40 minutes, 50 minutes, 1 hour, 1.5 hours, 2 hours	–	20 minutes
Manual Reset	1 minute, 2 minutes, 5 minutes, 10 minutes, 20 minutes, 30 minutes, 40 minutes, 50 minutes, 1 hour, 1.5 hours, 2 hours	–	1 minute
Nominal motor current	– Min: 1.0 A (for EMM...16-IFS) – Max: 16 A (for EMM...16-IFS) – Min. 0.3 A (for EMM...IFS) – Max: 4000 A (for EMM...IFS)	0.01 A	1.0 A (for EMM...16-IFS) 0.3 A (for EMM...IFS)
Behavior	– Disabled – Disable drive – Generate message	–	Disable drive

Parameter	Selection value	Interval	Program side
Acknowledgment	– Automatic – Manual	–	Manual

NOTE: Thermal overload

To prevent thermal overload of the drive, the parameterized value for the nominal motor current must correspond to the rating plate.

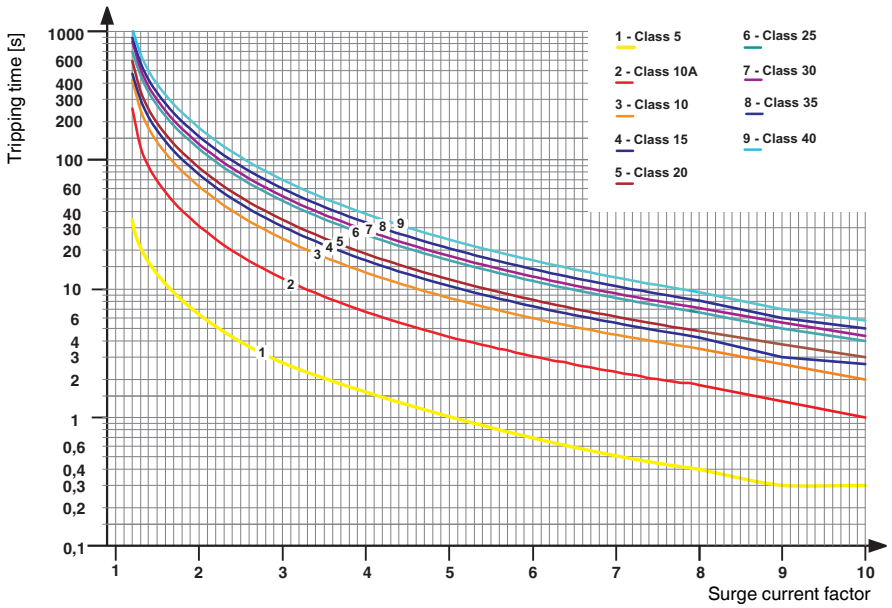


Figure 7-20 Trigger characteristic for 20°C (blocking protection)

The following tripping times apply according to the class curve:

Class	Tripping time
Class 5	0.4 s
Class 10A	1.8 s
Class 10	3.4 s
Class 15	4.1 s
Class 20	4.7 s
Class 25	6.4 s
Class 30	7.0 s
Class 35	7.8 s
Class 40	8.6 s

7.4.5.9 ShortToGround Detection

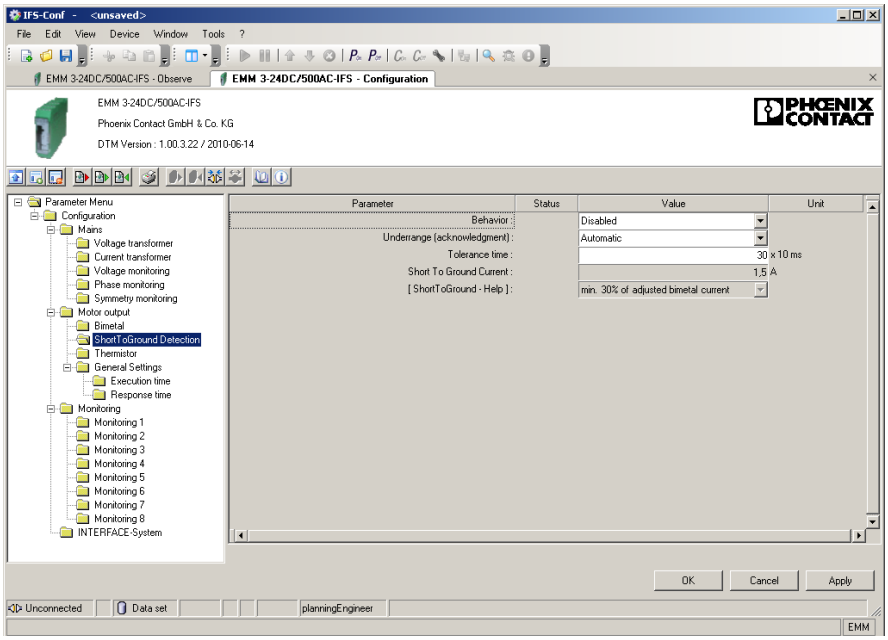


Figure 7-21 "ShortToGround Detection" configuration dialog box

The following parameter data can be set:

Parameter	Selection value	Interval	Program side
Behavior	– Disabled – Disable drive – Generate message	–	Disabled
Underrange (acknowledgment)	– Automatic – Manual	–	Automatic
Tolerance time	– Min: 0 – Max: 60000	1	30
Short To Ground Current	– Calculated, at least 30% of the set bimetal current	0.01	-

7.4.5.10 Thermistor

To protect the motor against thermal overload, if the motor winding is equipped with a thermistor, the appropriate behavior can be set here.

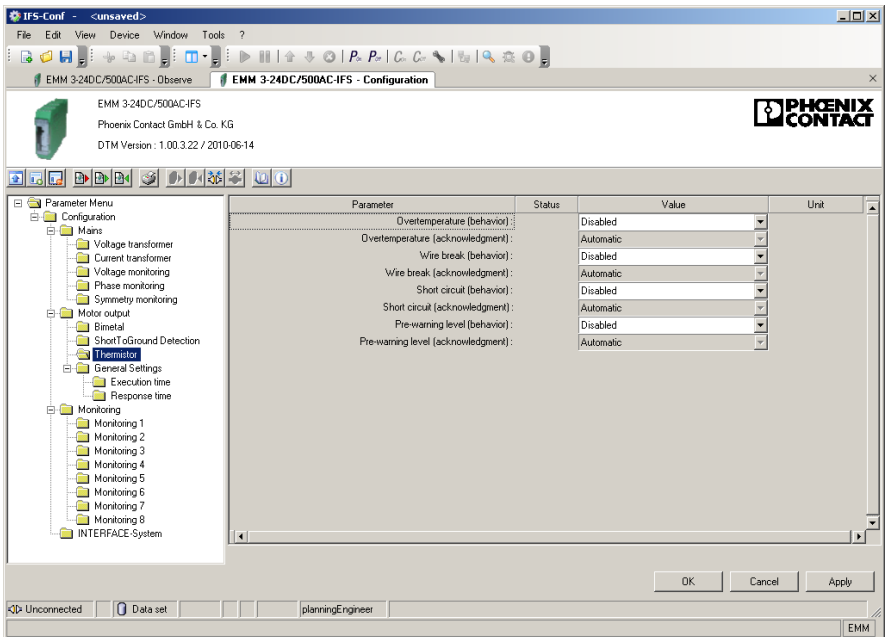


Figure 7-22 "Thermistor" configuration dialog box

The following parameter data can be set:

Parameter	Selection value	Interval	Program side
Overtemperature (behavior)	– Disabled – Disable drive – Generate message	–	Disabled
Overtemperature (acknowledgment)	– Automatic – Manual	–	Manual
Wire break (behavior)	– Disabled – Disable drive – Generate message	–	Disabled
Wire break (acknowledgment)	– Automatic – Manual	–	Manual
Short circuit (behavior)	– Disabled – Disable drive – Generate message	–	Disabled
Short circuit (acknowledgment)	– Automatic – Manual	–	Manual

Parameter	Selection value	Interval	Program side
Pre-warning level (behavior)	– Disabled – Disable drive – Generate message	–	Disabled
Pre-warning level (acknowledgment)	– Automatic – Manual	–	Automatic

7.4.5.11 Execution time

If an activation/deactivation command is present, the switch-on/shutdown procedure must be completed within a parameterizable time (see "General Settings" on page 7-44). The EMM … IFS detects this by measuring the main circuit. The behavior in the event of an error is configured here.

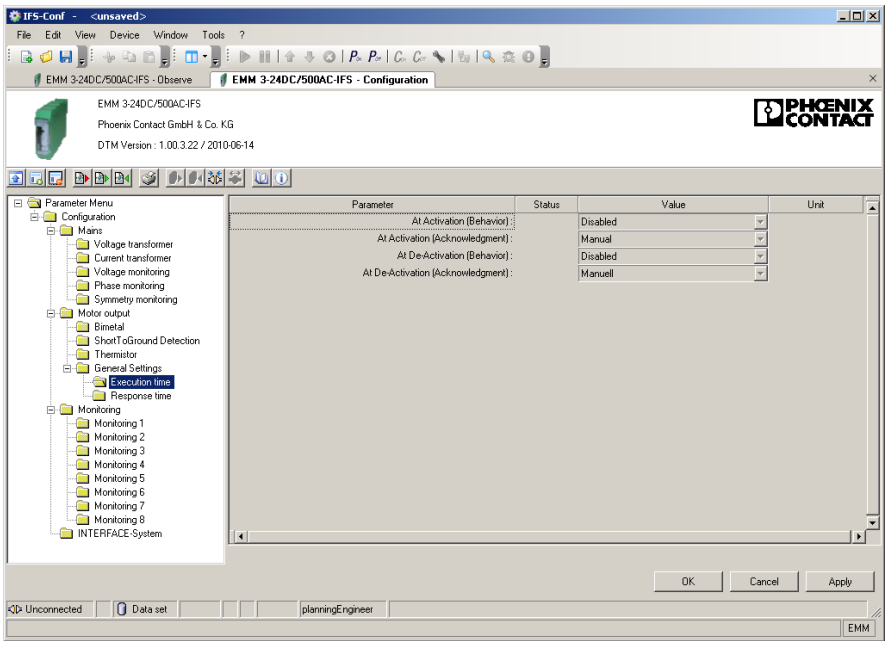


Figure 7-23 "Execution time" configuration dialog box

The following parameter data can be set:

Parameter	Selection value	Interval	Program side
At Activation (Behavior)	– Disabled – Disable drive – Generate message	–	Disabled
At Activation (Acknowledgment)	– Manual	–	Manual
At De-Activation (Behavior)	– Disabled – Disable drive – Generate message	–	Disabled
At De-Activation (Acknowledgment)	– Manual	–	Manual

7.4.5.12 Response time

The EMM 3-xx/500AC-xx-IFS module monitors the confirmation of the control command. The confirmation behavior in the event of an error can be configured here.

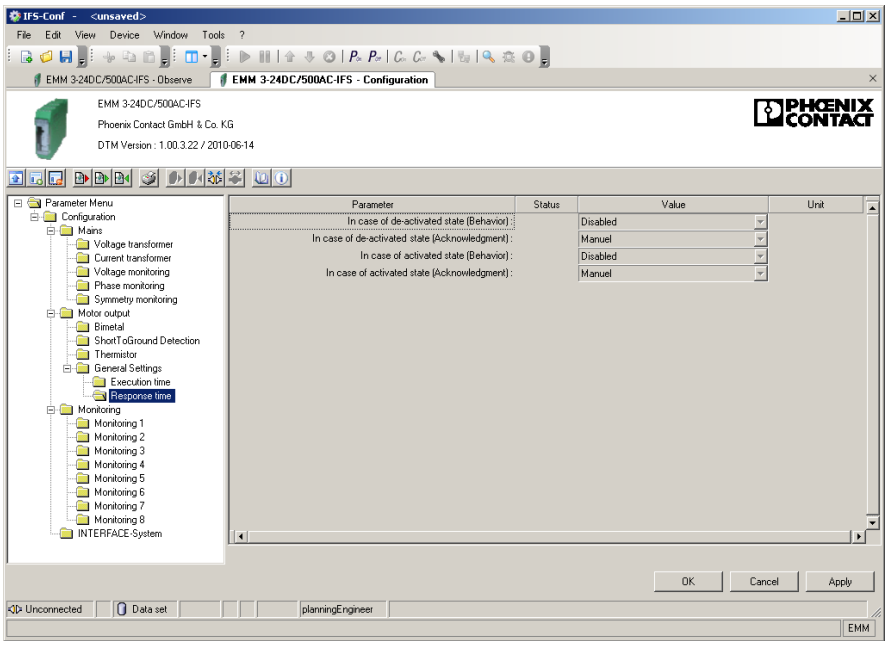


Figure 7-24 "Response time" configuration dialog box

The following parameter data can be set:

Parameter	Selection value	Interval	Program side
In case of de-activated state (Behavior)	– Disabled – No restart – Generate message	–	Disabled
In case of de-activated state (Acknowledgment)	– Manual	–	Manual
In case of activated state (Behavior)	– Disabled – No restart – Generate message	–	Disabled
In case of activated state (Acknowledgment)	– Manual	–	Manual

7.4.5.13 Monitoring 1 ... 8

You can monitor up to eight measured values simultaneously and use them as switching or signaling thresholds depending on the configuration. This means that you can implement not only motor protection, but also protection for units or mechanical elements connected downstream, in particular.

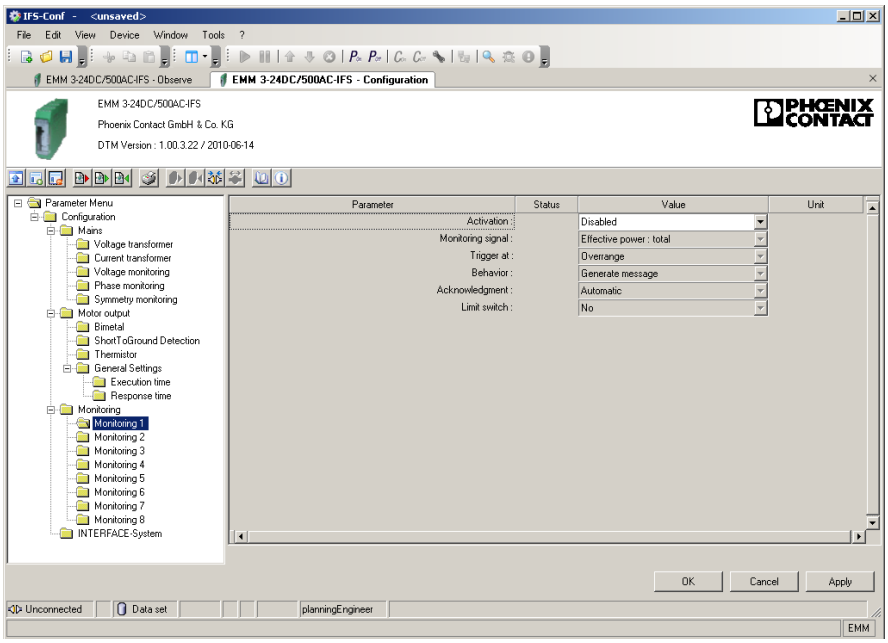


Figure 7-25 "Monitoring" configuration dialog box

The following parameter data can be set:

Parameter	Selection value	Interval	Program side
Activation	– Disabled – Always – During right and left rotation – During right rotation – During left rotation – On demand right rotation – On demand left rotation	–	Disabled

Parameter	Selection value	Interval	Program side
Monitoring signal	– Effective power : total – Effective power : L1 – Effective power : L2 – Effective power : L3 – Motor current : L1 – Motor current : L2 – Motor current : L3 – Voltage : L1 – Voltage : L2 – Voltage : L3 – Frequency – Apparent-power – Apparent-power : L1 – Apparent-power : L2 – Apparent-power : L3 – Non-active power – Non-active power : L1 – Non-active power : L2 – Non-active power : L3 – Cos phi – Cos phi : L1 – Cos phi : L2 – Cos phi : L3 – Energy meter – Energy meter reset – Elapsed-hour meter left rotation – Elapsed-hour meter left rotation reset – Elapsed-hour meter right rotation – Elapsed-hour meter right rotation reset – Elapsed-hour meter last interval – Operating cycle counter left rotation – Operating cycle counter left rotation reset – Operating cycle counter right rotation – Operating cycle counter right rotation reset – Standstill time – Standstill time last interval		Effective power : total
Trigger at	– Overrange – Underrange		Overrange
Behavior	– Disable drive – Generate message		Generate message
Acknowledgment	– Automatic – Manual		Automatic

Parameter	Selection value	Interval	Program side
Limit switch	– No – Left – Right		No

7.4.5.14 INTERFACE-System

The device's behavior in the event of an error in the INTERFACE system can be set here.

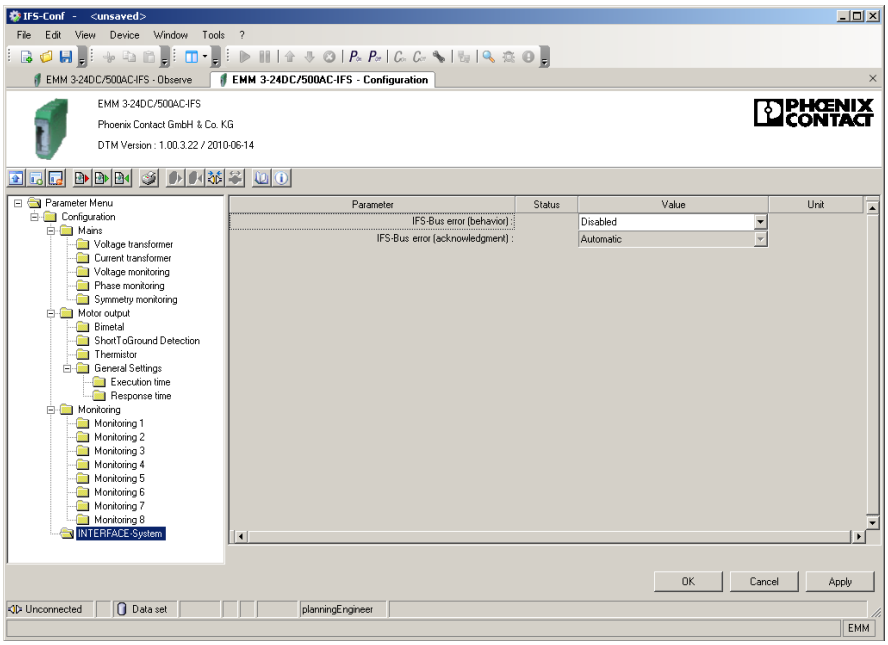


Figure 7-26 "INTERFACE-System" configuration dialog box

The following parameter data can be set:

Parameter	Selection value	Interval	Program side
IFS-Bus error (behavior)	– Disabled – Disable drive – Generate message	–	Disable drive
IFS-Bus error (acknowledgment)	– Automatic – Manual	–	Automatic

7.4.6 Online/offline parameters

Before opening the online or offline parameter dialog box, the changes made in the "Settings" dialog box should be applied.

Clicking on the "Online Parameter" or "Offline Parameter" button in the IFS-Conf toolbar opens the parameter dialog box.

Online and offline parameters differ as follows:

– Online parameters

  The values are read directly from the device and are also written directly to the device by clicking "Apply" or "OK"

– Offline parameters

  The values are written to the project that is open on the PC. When started for the first time, the default parameter data is displayed.

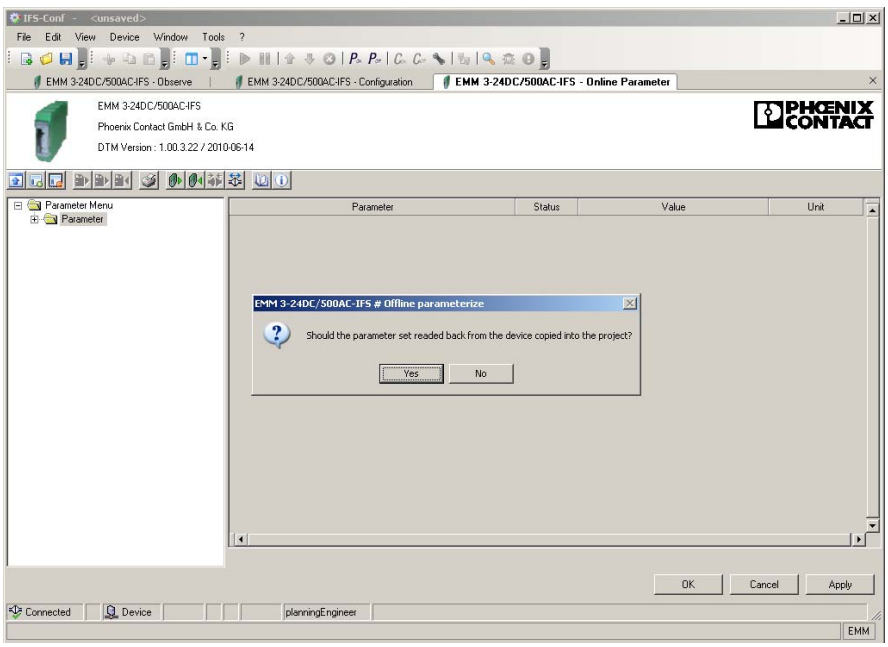


Figure 7-27 Message when switching to the "Online Parameter" dialog box

If you wish to proceed in the "Online Parameter" dialog box, you must first write the changes made to the device by clicking on "Write to device".

If you wish to proceed in the "Offline Parameter" dialog box, you must first click "Apply" or "OK" in the "Settings" dialog box.

7.4.6.1 Min. switchover delay time

To prevent damage to the motor output, e.g., due to a short circuit of the main circuits, a minimum switch-over delay time must be observed when changing direction. The duration of the switch-over delay time ensures that the two main circuits are not activated simultaneously.

So that the fields are activated, the switching output type must be set to "Reversing starter" or "Star/delta LR" in the "Motor output" settings window.

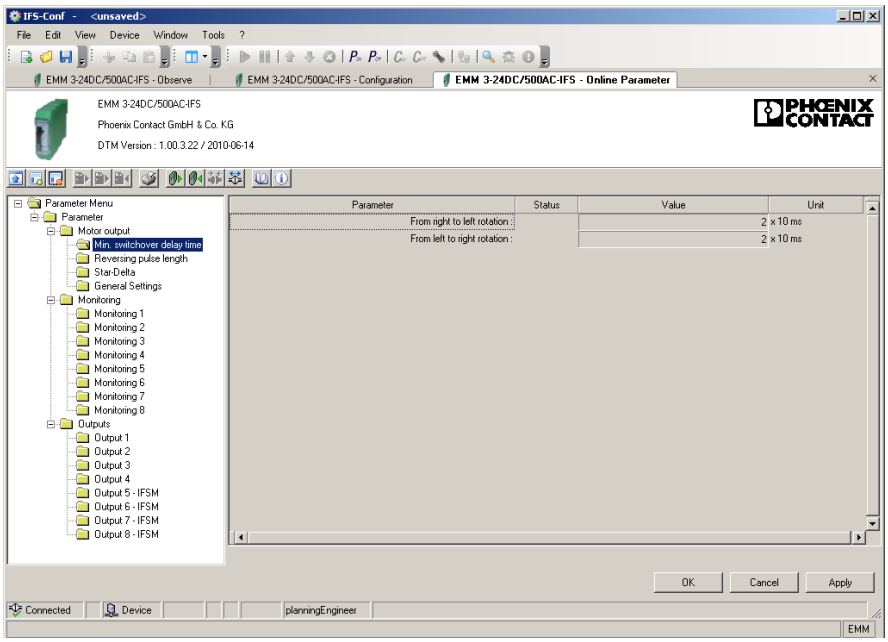


Figure 7-28 "Min. switchover delay time" parameter dialog box

The following parameter data can be set:

Parameter	Selection value	Interval	Program side
From right to left rotation	– Min: 1 – Max: 60000	1	2
From left to right rotation	– Min: 1 – Max: 60000	1	2

7.4.6.2 Reversing pulse length

To prevent mechanical damage to the drive, e.g., due to the sudden stopping of moving masses, a reversing pulse length must be provided when changing direction.

So that the fields are activated, the switching output type must be set to "Reversing starter" or "Star/delta LR" in the "Motor output" settings window.

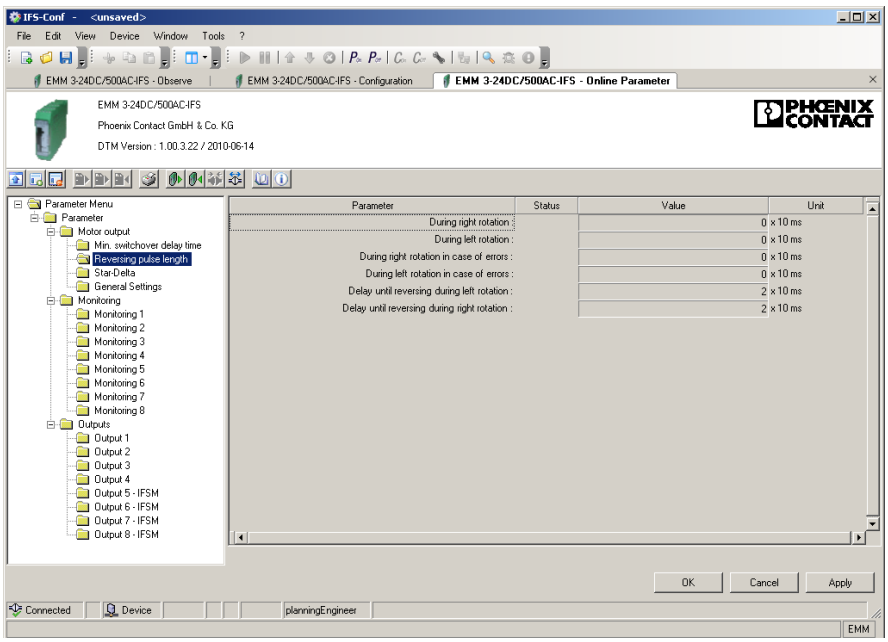


Figure 7-29 "Reversing pulse length" parameter dialog box

The following parameter data can be set:

Parameter	Selection value	Interval	Program side
During right rotation	– Min: 0 – Max: 60000	1	0
During left rotation	– Min: 0 – Max: 60000	1	0
During right rotation in case of errors	– Min: 0 – Max: 60000	1	0
During left rotation in case of errors	– Min: 0 – Max: 60000	1	0
Delay until reversing during left rotation	– Min: 0 – Max: 60000	1	2
Delay until reversing during right rotation	– Min: 0 – Max: 60000	1	2

7.4.6.3 Star-Delta

A star/delta circuit is used to enable larger three-phase induction motors with short-circuit rotors (from approximately 5.5 kW) to start up. This prevents fuses from tripping and any voltage dips caused by the high starting current during direct switch on.

- Switch-over from star circuit to delta circuit must not be possible until the motor has started up. If switch-over is initiated too soon, a strong surge current occurs and switch-over is consequently not achieved.
- By reducing the torque to one third, the star/delta switch-over can only take place under undemanding startup conditions, e.g., when starting no-load machine tools.

So that the fields are activated, the switching output type must be set to "Star/delta" or "Star/delta LR" in the "Motor output" settings window.

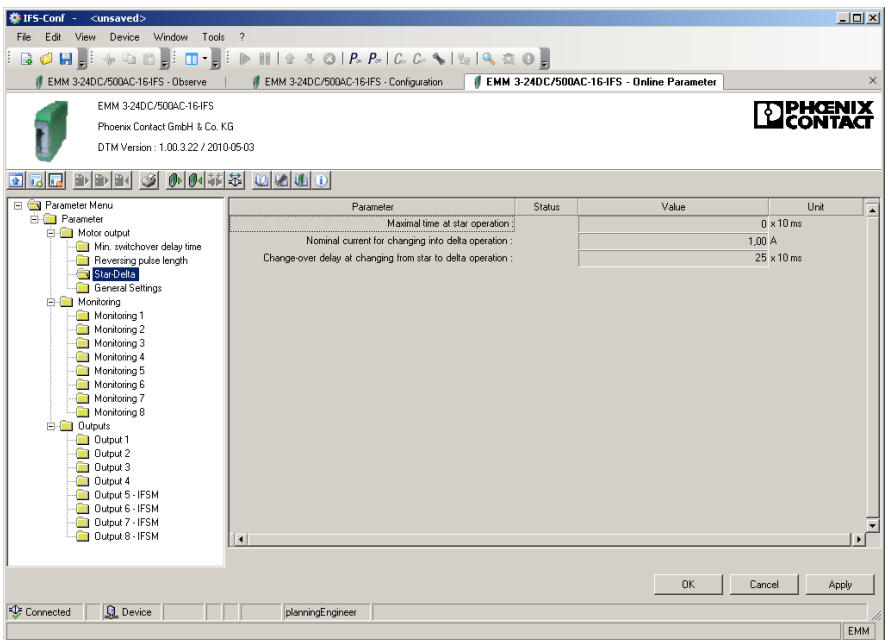


Figure 7-30 "Star-Delta" parameter dialog box

The following parameter data can be set:

Parameter	Selection value	Interval	Program side
Maximal time at star operation	– Min: 0 – Max: 60000	1	2000
Nominal current for changing into delta operation	– Min: 0 – Max: 160000	0.01	1
Change-over delay at changing from star to delta operation	– Min: 25 – Max: 60000	1	25

7.4.6.4 General Settings

The times for the behavior of the execution time and response time set under "Execution time" on page 7-34 and "Response time" on page 7-35 can be configured here.

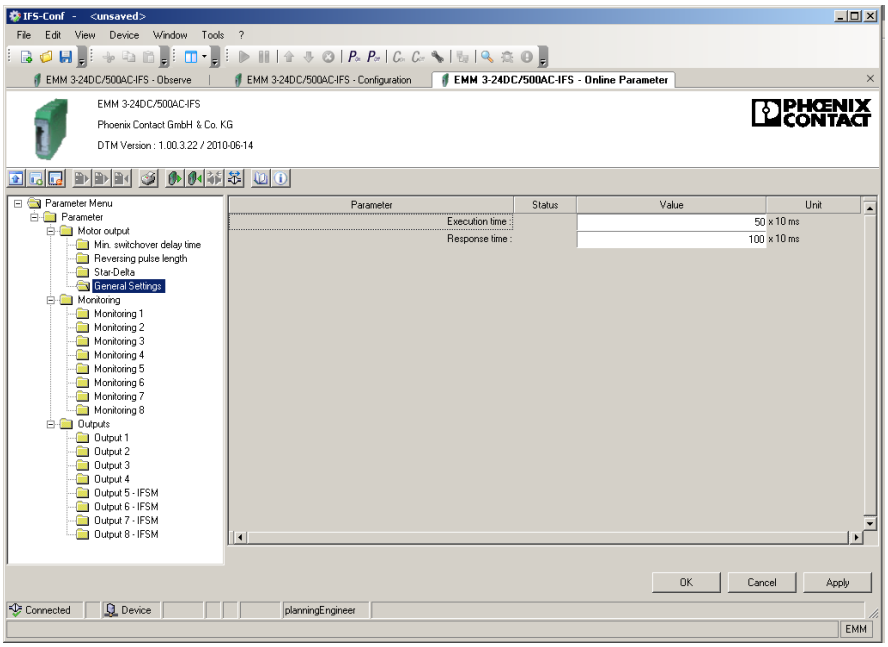


Figure 7-31 "General Settings" parameter dialog box

The following parameter data can be set:

Parameter	Selection value	Interval	Program side
Execution time	– Min: 0 – Max: 60000	1	50
Response time	– Min: 0 – Max: 60000	1	100

7.4.6.5 Monitoring 1 ... 8

The switching or signaling thresholds for the monitoring functions set under "Monitoring 1 ... 8" on page 7-36 can be configured here.

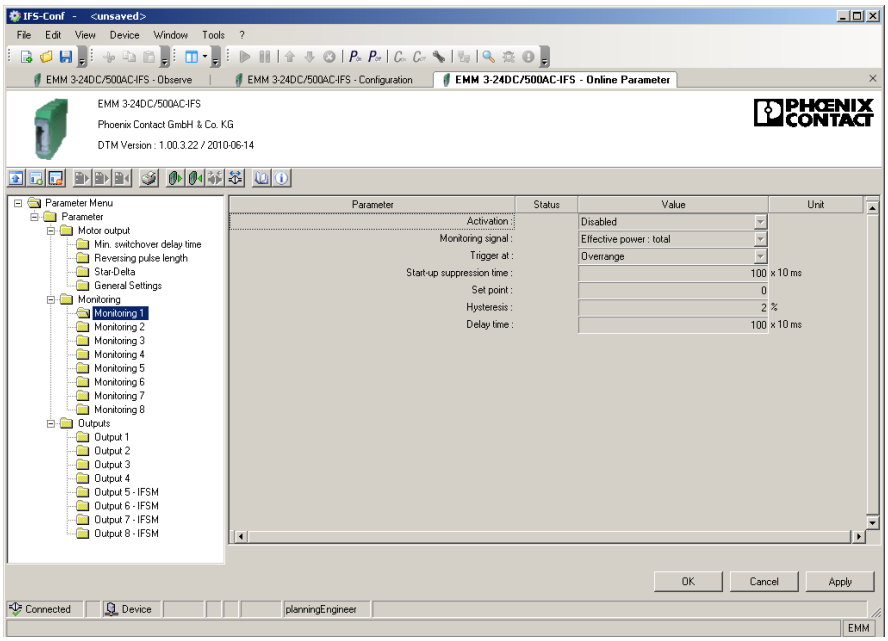


Figure 7-32 "Monitoring 1 ... 8" parameter dialog box

The following parameter data can be set:

Parameter	Selection value	Interval	Program side
Start-up suppression time	– Min: 0 – Max: 60000	1	100
Set point	– Min: -5000000 – Max: 5000000	1	0
Hysteresis	– Min: 0.1 – Max: 100	0.1	2
Delay time	– Min: 0 – Max: 60000	1	100

Examples

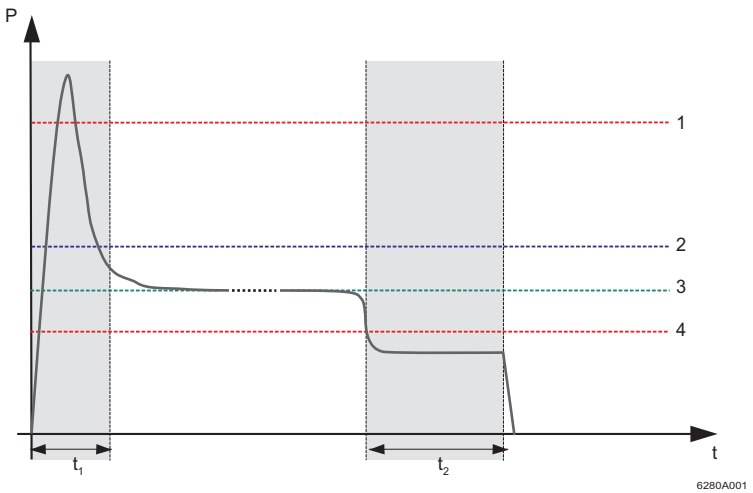


Figure 7-33 Underload example

P Real power

t Time

t_1 Start-up suppression time

t_2 Delay time

1 Upper performance threshold

2 Signaling threshold for filter/screen contamination

3 Performance

4 Lower performance threshold

Figure 7-33 shows an example of the real power curve for a pump where the real power remains below the lower performance threshold even after a time delay. This may be due to dry running.

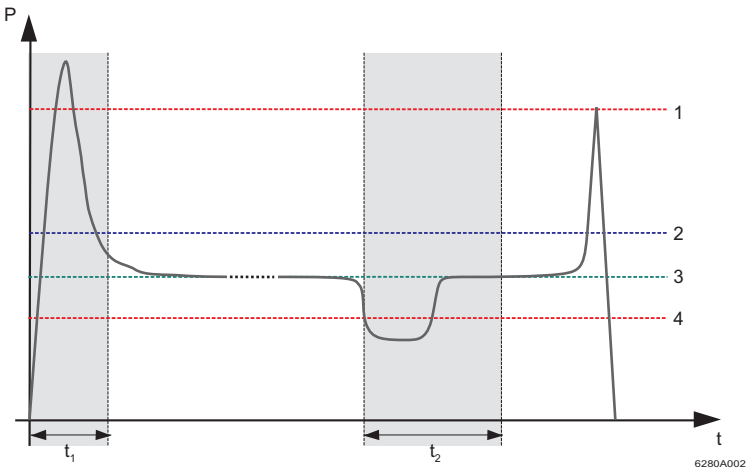


Figure 7-34 Overload example

P	Real power
t	Time
t_1	Start-up suppression time
t_2	Delay time

1 Upper performance threshold
2 Signaling threshold for filter/screen contamination
3 Performance
4 Lower performance threshold

Figure 7-34 shows an example of temporary dry running (air bubble in the system). For example, the upper performance threshold is reached in the event of a blockage. The performance level is reached again before the time delay has elapsed.

7.4.6.6 Outputs 1 ... 8 - IFS

Depending on the selected motor output type (see "Motor output" on page 7-27), the assignment of the available output signals is fixed. Additional controls for the outputs can be selected individually.

Output signals "Output 5 - IFS" to "Output 8 - IFS" are only available via the GSD file as a status bit in PROFIBUS, see "EMM objects" on page 4-20.

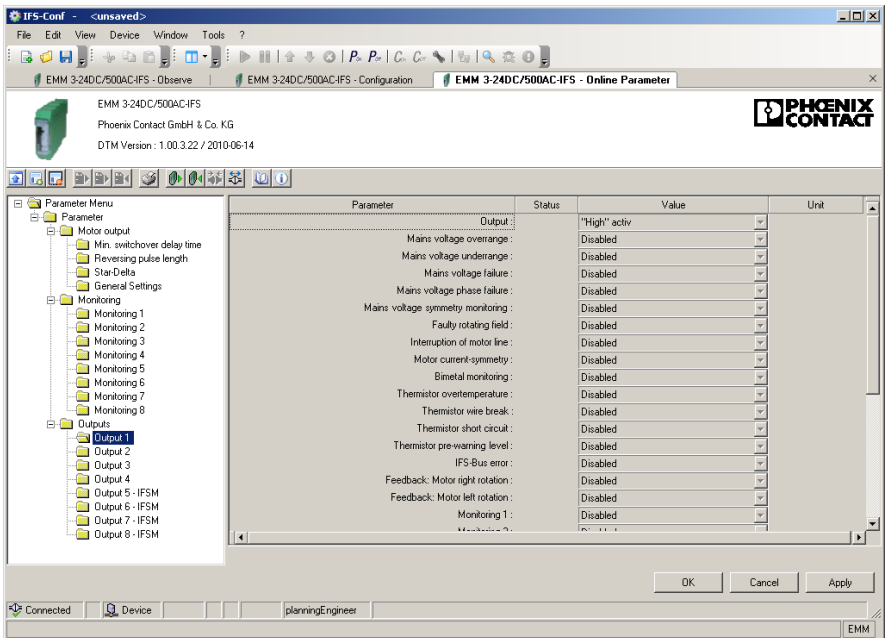


Figure 7-35 "Outputs 1 ... 8" parameter dialog box

The following parameter data can be set:

Parameter	Selection value	Interval	Program side
Output	– "High" active – "Low" active	–	"High" active
Mains voltage overrange	– Disabled – Enabled	–	Disabled
Mains voltage underrange	– Disabled – Enabled	–	Disabled
Mains voltage failure	– Disabled – Enabled	–	Disabled
Mains voltage phase failure	– Disabled – Enabled	–	Disabled
Mains voltage symmetry monitoring	– Disabled – Enabled	–	Disabled
Faulty rotating field	– Disabled – Enabled	–	Disabled

Parameter	Selection value	Interval	Program side
Interruption of motor line	– Disabled – Enabled	–	Disabled
Motor current-symmetry	– Disabled – Enabled	–	Disabled
Bimetal monitoring	– Disabled – Enabled	–	Disabled
Thermistor overtemperature	– Disabled – Enabled	–	Disabled
Thermistor wire break	– Disabled – Enabled	–	Disabled
Thermistor short circuit	– Disabled – Enabled	–	Disabled
Thermistor pre-warning level	– Disabled – Enabled	–	Disabled
IFS-Bus error	– Disabled – Enabled	–	Disabled
Feedback: Motor right rotation	– Disabled – Enabled	–	Disabled
Feedback: Motor left rotation	– Disabled – Enabled	–	Disabled
Monitoring 1	– Disabled – Enabled	–	Disabled
Monitoring 2	– Disabled – Enabled	–	Disabled
Monitoring 3	– Disabled – Enabled	–	Disabled
Monitoring 4	– Disabled – Enabled	–	Disabled
Monitoring 5	– Disabled – Enabled	–	Disabled
Monitoring 6	– Disabled – Enabled	–	Disabled
Monitoring 7	– Disabled – Enabled	–	Disabled
Monitoring 8	– Disabled – Enabled	–	Disabled
Execution time at activation	– Disabled – Enabled	–	Disabled
Execution time at deactivation	– Disabled – Enabled	–	Disabled

Parameter	Selection value	Interval	Program side
Response time at activation state	– Disabled – Enabled	–	Disabled
Response time at deactivation state	– Disabled – Enabled	–	Disabled
Error Overcurrent	– Disabled – Enabled	–	Disabled
ShortToGround	– Disabled – Enabled	–	Disabled

7.4.7 Writing the configuration to the device

When you write the configuration to the device ("Write to device" button, see "Buttons in the DTM toolbar" on page 7-17), a window appears containing an overview of your configuration.

Clicking "OK" confirms this configuration and the device restarts with this configuration.

Clicking "Cancel" makes the configuration in the device invalid and the devices enters the "invalid configuration" error state. To exit this error state, repeat the write process with a valid configuration and confirm it with "OK".

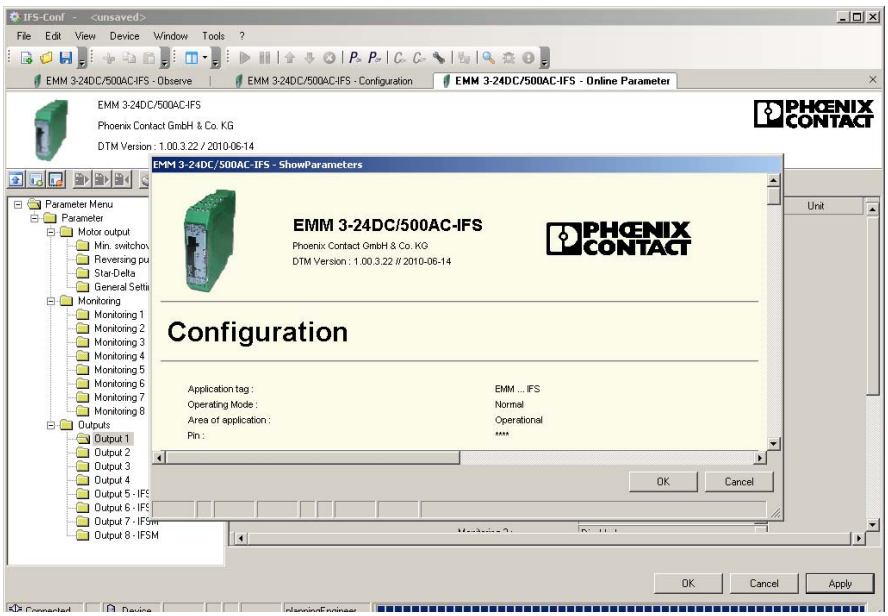


Figure 7-36 Writing the configuration to the device

7.5 Monitoring dialog box

The current operating values of an electrical drive are checked and recorded via the EMM 3- xx/500AC/xx-IFS module. The monitoring dialog box enables the continuous transfer of data, which can be saved in a separate SGL record file.

This data can be used at a later time, e.g., for diagnostic and optimization purposes.

7.5.1 Buttons

Icon	Meaning	Description
	Acknowledge error	Current error/fault messages are acknowledged.
	Read characteristic curve	Characteristic curve data (SGL format) saved on the service PC is loaded and displayed for diagnostic purposes.
	Manual control	Request for manual operation of drive (left rotation, stop, right rotation)
	Fast left rotation	Manual request – fast left rotation
	Left rotation	Manual request – left rotation
	Stop	Manual request – stop
	Right rotation	Manual request – right rotation
	Fast right rotation	Manual request – fast right rotation

7.5.2 Overview

The "Overview" dialog box displays all the operating data and status messages that provide initial information. This dialog box enables a quicker and more comprehensive overview of the general system state.

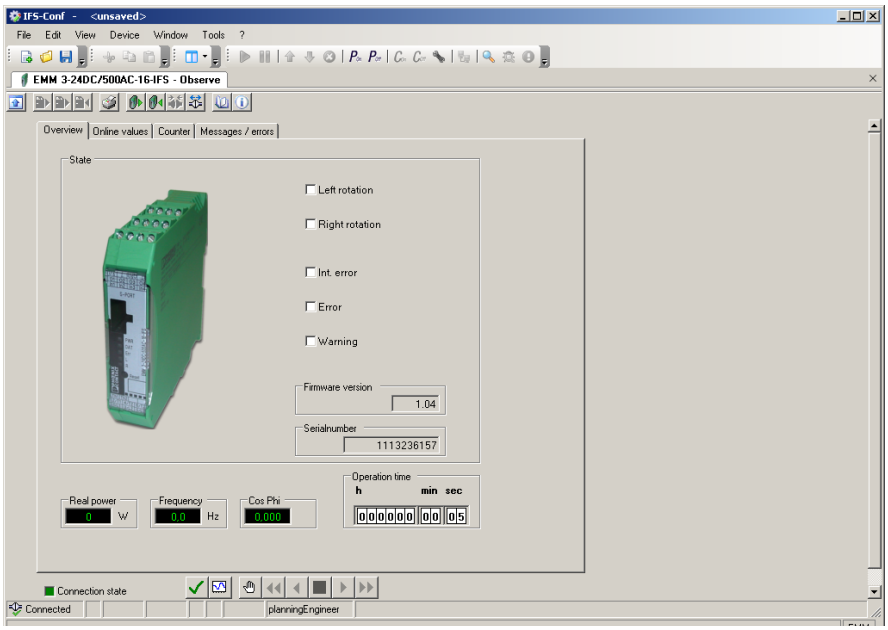


Figure 7-37 "Overview" monitoring dialog box

The following operating data can be determined and displayed:

Status display	Meaning	Unit
Left rotation/Right rotation	Status message regarding the current direction of rotation at the output.	–
Int. error	Internal error event message is present	–
Error/Warning	Error message/warning is present	–
(green)	Operating	–
(yellow)	Warning	–
(red)	Error/fault message	–

Numerical display	Meaning	Unit
Real power	Display of total real power	W
Frequency	Display of mains frequency	Hz
Cos Phi	Display of total power factor Cos Phi	–
Operation time	Display of operating time (data is saved internally on the device)	hhhhhh:mm:ss

7.5.3 Online values

On this dialog page, all online values are displayed as numerical values. To record a waveform for a display value, move the cursor over the corresponding value and double-click to open scope view (see "Displaying online values as a graph" on page 7-55).

For the real power, apparent power, reactive power, and power factor Cos Phi online values, the total and phase-specific graphs are always displayed.

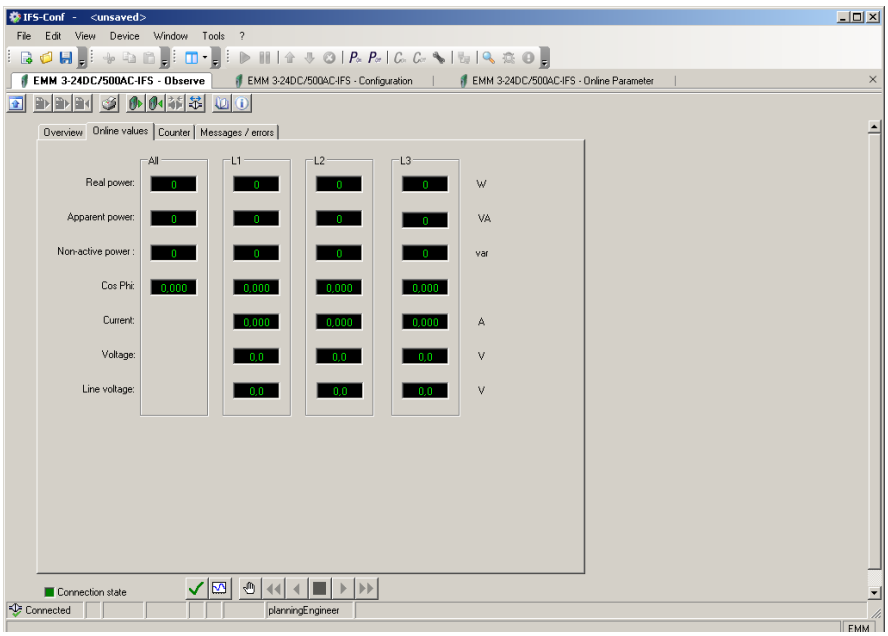


Figure 7-38 "Online values" monitoring dialog box

The following operating data can be determined and displayed:

Numerical display	Meaning	Unit
Real power	Display of total and phase-specific real power	W
Apparent power	Display of total and phase-specific apparent power	VA
Non-active power	Display of total and phase-specific reactive power	var
Cos Phi	Display of total and phase-specific power factor Cos Phi	–
Current	Display of phase-specific line currents	A
Voltage	Display of phase-specific nominal voltage values	V
Line voltage	Display of phase-specific line voltage values	V

7.5.3.1 Displaying online values as a graph

If you wish, for example, to compare the graphs for the real power of phases L1 ... L3, you can record each of these three components in succession and load the three characteristic curves and the current values in the same scope view. The following information is displayed in scope view:

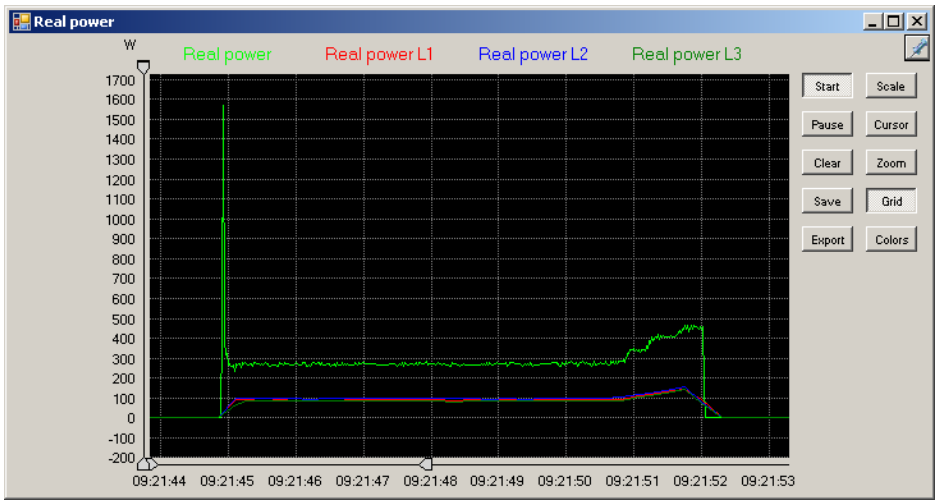


Figure 7-39 Representation of online values

The following functions are executed by clicking on the buttons:

Button	Description
Start	Clicking the button starts/stops the recording phase.
Pause	Clicking the button interrupts/continues the recording phase.
Clear	Clicking the button deletes the displayed graph. The recording phase is not interrupted.
Save	Clicking the button calls the "Save As" dialog box. The saved data is automatically assigned the file extension ***.sgl**.
Export	Clicking the button calls the "CSV Export" dialog box. The current graph can be exported as a CSV file.
Scale	Clicking the button returns a magnified image display detail to its original size.
Cursor	Clicking the button shows/hides the cursor. The cursor can be used for diagnostic purposes to precisely select a point on the graph and to display the corresponding numerical values. Cursor 1 can be activated by left-clicking on the curve name (in the example: Real power, Real power L1, etc.). Cursor 2 can be activated and the values of Cursor 1 and Cursor 2 compared by right-clicking on the curve name (in the example: Real power, Real power L1, etc.).
Zoom	Clicking the button enlarges the area on the Y-axis defined by the two limit markers to fit the entire screen height.

Button	Description
Grid	Clicking the button activates/deactivates the background grid for better orientation on the graph.
Colors	Clicking the button enables you to define the colors that are preassigned on the program side in scope view.

Save curve as...

Clicking the "Save" button calls the "Save As" dialog box. Enter the required file name here, according to Windows conventions.

The curve file is automatically assigned the file extension ***.sgl**.

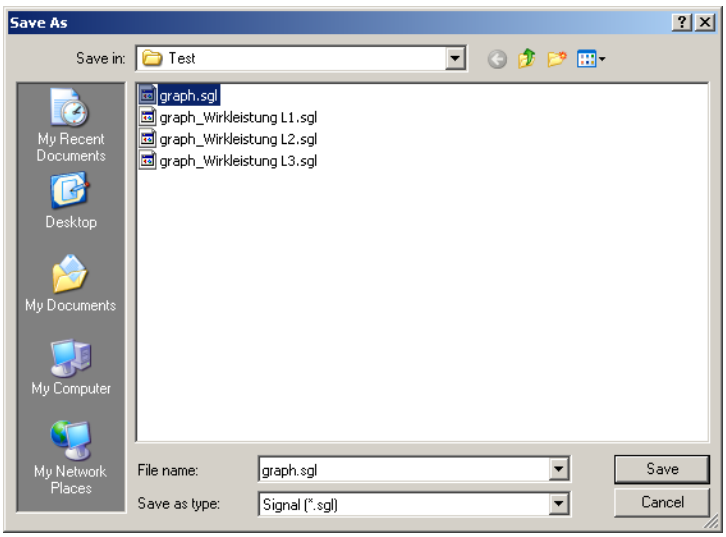


Figure 7-40 "Save As" dialog box

Open curve

Clicking the "Read curve" button (see "Buttons" on page 7-52) calls the "Open" dialog box. Here, select the required archive file with the extension ***.sgl**. The curve data is then loaded and displayed on the service PC for evaluation.

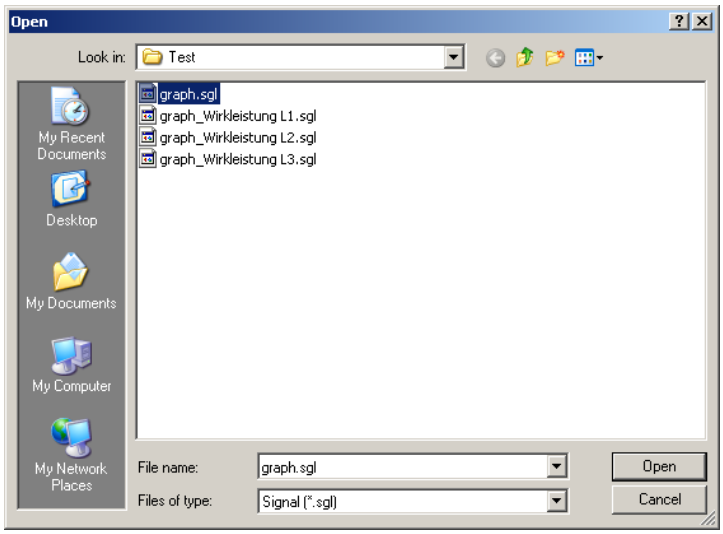


Figure 7-41 "Open" dialog box

Export curve

Clicking the "Export" button calls the "CSV Export" dialog box. You can export the current graph as a CSV file.

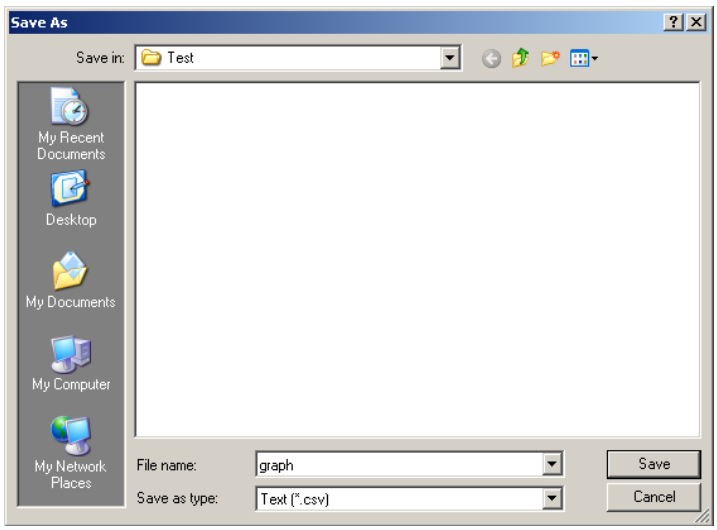


Figure 7-42 Export file dialog box

The time is saved in the following format in the CSV file: hh:mm:ss,000. This should be noted when importing into Excel.

7.5.4 Counter

This dialog page provides an overview of the previous operating hours and cycles of the connected EMM 3- xx/500AC/xx-IFS. This data is saved internally on the device. You can thus determine various operating values for specific days.

Clicking the relevant "Reset" button resets the corresponding day counter.

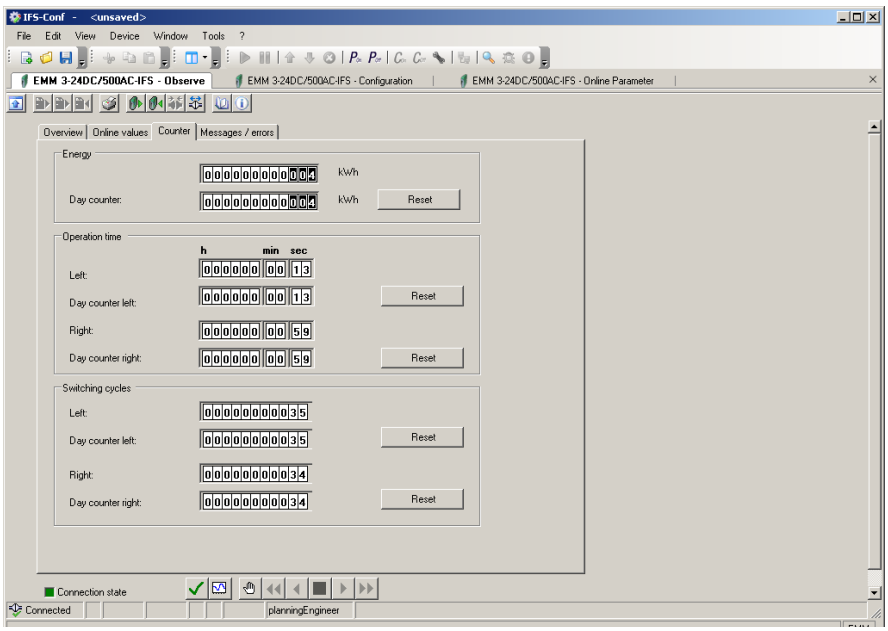


Figure 7-43 "Counter" monitoring dialog box

The following operating data can be determined and displayed:

Numerical display	Meaning	Unit
Energy	**Display of total energy used**	kWh
– Day counter	Display of day's energy used	
Operation time	**Display of operating times**	hhhhh:mm:ss
– Left	Display of left rotation total counter	
– Day counter left	Display of left rotation day counter	
– Right	Display of right rotation total counter	
– Day counter right	Display of right rotation day counter	
Switching cycles	**Display of cycles**	11 digits
– Left	Display of left rotation total cycles	
– Day counter left	Display of left rotation day cycles	
– Right	Display of right rotation total cycles	
– Day counter right	Display of right rotation day cycles	

7.5.5 Messages/errors

This dialog page provides a quick and comprehensive view of the status of warnings and error messages.

Depending on the parameterization, it may be possible that fault messages are displayed fleetingly for the active monitoring item.

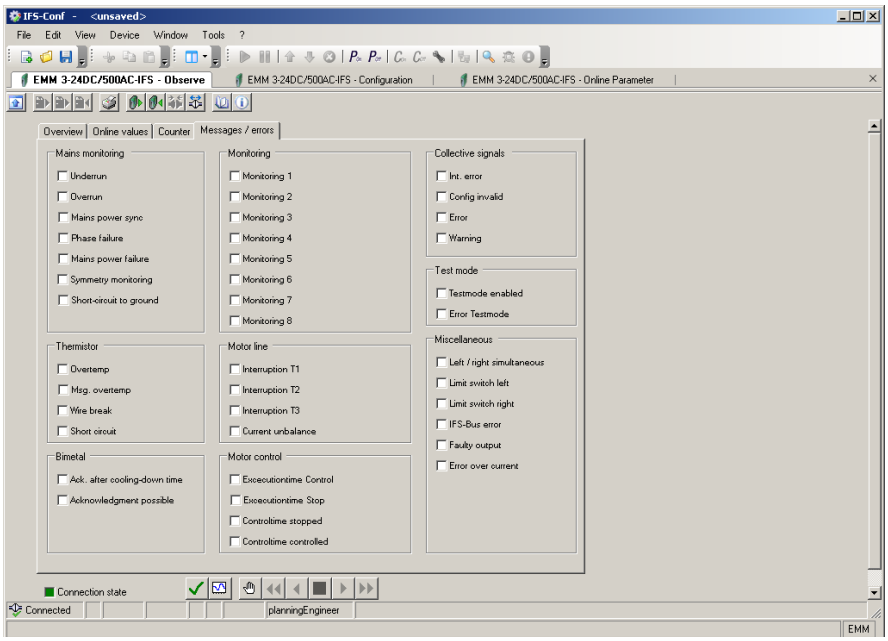


Figure 7-44 "Messages / errors" monitoring dialog box

The following operating data can be determined and displayed:

Display	Meaning
Mains monitoring	
– Underrun	Mains voltage underrange detected (see "Voltage monitoring" on page 7-23)
– Overrun	Mains voltage overrange detected (see "Voltage monitoring" on page 7-23)
– Mains power sync	Phase relation on the mains side (direction of rotating field) not observed
– Phase failure	Phase failure detected (see "Phase monitoring" on page 7-25)
– Mains power failure	Mains failure detected (see "Phase monitoring" on page 7-25)
– Symmetry monitoring	Uneven load or loss of a phase (see "Symmetry monitoring" on page 7-26)
– Short-circuit to ground	A phase conductor is connected to ground, the EMM 3- xx/500AC/xx-IFS module is disabled
Monitoring	
– Monitoring 1 ... 8	A parameterized value of monitoring 1 ... 8 is outside its limits (see "Monitoring 1 ... 8" on page 7-36 and "Monitoring 1 ... 8" on page 7-45)

Display	Meaning
Collective signals	
– Int. error	Send the EMM 3- xx/500AC/xx-IFS module back to the manufacturer. A factory inspection must be performed.
– Config invalid	Error sending to the device or the process was interrupted.
– Error	A group error has occurred, e.g., a parameterized trigger threshold was exceeded.
– Warning	A parameterized signaling threshold has been exceeded.
Test mode	
– Testmode enabled	Test mode is activated.
– Error Testmode	An error has been detected in test mode.
Thermistor	
– Overtemp	An impermissibly high operating temperature was detected in a motor winding.
– Msg. overtemp	The prealarm threshold for triggering a warning has been reached.
– Wire break	An open circuit was detected in the thermistor cable of a motor winding.
– Short circuit	A short circuit was detected in the thermistor cable of a motor winding.
Motor line	
– Interruption T1 ... T3	An open circuit was detected in the motor winding.
– Current unbalance	Asymmetrical current load in the phase conductors.
Bimetal	
– Ack. after cooling-down time	The parameterized limit values for motor protection were exceeded and resulted in tripping. The message can only be acknowledged after the parameterized cooling time has elapsed (see "Bimetal" on page 7-29).
– Acknowledgment possible	The message can be acknowledged.
Motor control	
– Excecutiontime Control	The execution time for activation has been exceeded.
– Excecutiontime Stop	The execution time for stop has been exceeded.
– Controltime stopped	The response time for stopped drive has been exceeded.
– Controltime controlled	The response time for activation has been exceeded.
Miscellaneous	
– Left / right simultaneous	Left and right rotation were requested simultaneously.
– Limit switch left	Status message: left limit position reached
– Limit switch right	Status message: right limit position reached
– IFS-Bus error	Bus error has been detected between EMM 3- xx/500AC/xx-IFS module and programming adapter or EM-PB-GATEWAY-IFS
– Faulty output	For EMM 3- **24DC**/500AC-xx-IFS modules only: Error display of 24 V outputs
– Error over current	For EMM 3-xx/**500AC-IFS** only: If the measured value is greater than 6 A for more than 9 seconds: "Operational" area of application: Message is generated. "ATEX" area of application: Motor is shut down.

8 Application examples

8.1 Example 1 - Without switching function, with power meter monitoring

The EMM module is to be used as a power meter. If the day counter reaches 20 kWh, output 1 should output a warning which is automatically acknowledged when the day counter is reset.

8.1.1 Hardware configuration

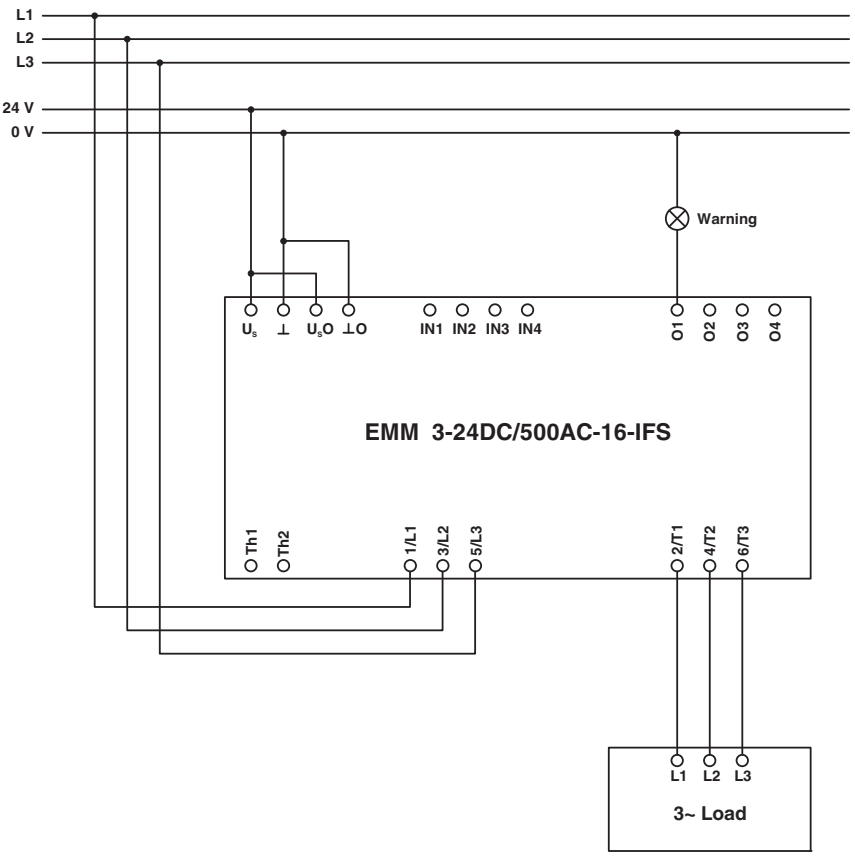


Figure 8-1 Hardware configuration example 1

8.1.2 Software configuration

For this example, the following parameters must be changed in the DTM:

Dialog box	Parameter menu	Parameter	Set value
Configuration	Motor output - General Settings	Switching output type	Digital outputs, no switching function
	Monitoring - Monitoring 1	Activation	Always
		Monitoring signal	Energy meter reset
		Trigger at	Overrange
		Behavior	Generate message
		Acknowledgment	Manual
Online Parameter	Monitoring - Monitoring 1	Start-up suppression time	0 x 10 ms
		Set point	20 kWh
		Delay time	0 x 10 ms
	Outputs - Output 1	Monitoring 1	Enabled

8.2 Example 2 - Direct starter for pump monitoring

Dry running or blockages can occur when using pumps. To protect the pump motor and the pump, the motor real power can be monitored and the motor shut down or a message generated in the event of nominal value overrange or underrange.

Output 3 should be used as the pre-warning message output (overrange and underrange).

Output 4 should be used as the error message output (overrange and underrange).

Set the motor current on the ELR H3…

8.2.1 Hardware configuration

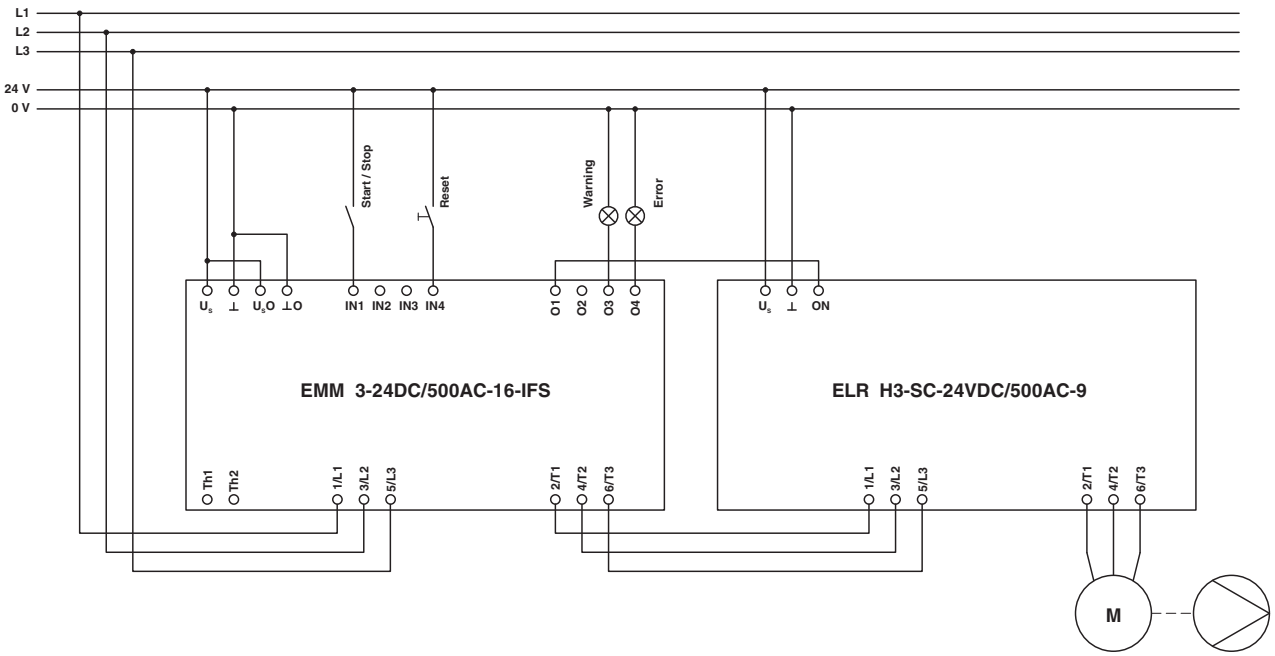


Figure 8-2 Hardware configuration example 2

8.2.2 Software configuration

For this example, the following parameters must be changed in the DTM:

Dialog box	Parameter menu	Parameter	Set value
Configuration	Motor output - General Settings	Switching output type	Direct starter
	Monitoring - Monitoring 1 Early warning of dry running, e.g., air bubble	Activation	During right rotation
		Monitoring signal	Effective power : total
		Trigger at	Underrange
		Behavior	Generate message
		Acknowledgment	Automatic
	Monitoring - Monitoring 2 Shutdown in the event of dry running	Activation	During right rotation
		Monitoring signal	Effective power : total
		Trigger at	Underrange
		Behavior	Disable drive
		Acknowledgment	Manual
	Monitoring - Monitoring 3 Early warning of blockage	Activation	During right rotation
		Monitoring signal	Effective power : total
		Trigger at	Overrange
		Behavior	Generate message
		Acknowledgment	Automatic
	Monitoring - Monitoring 4 Shutdown in the event of blockage	Activation	During right rotation
		Monitoring signal	Effective power : total
		Trigger at	Overrange
		Behavior	Disable drive
		Acknowledgment	Manual

Dialog box	Parameter menu	Parameter	Set value
Online Parameter	Monitoring - Monitoring 1	Start-up suppression time	50 x 10 ms
		Set point	280 W
		Delay time	0 x 10 ms
	Monitoring - Monitoring 2	Start-up suppression time	200 x 10 ms
		Set point	250 W
		Delay time	200 x 10 ms
	Monitoring - Monitoring 3	Start-up suppression time	50 x 10 ms
		Set point	600 W
		Delay time	5 x 10 ms
	Monitoring - Monitoring 4	Start-up suppression time	200 x 10 ms
		Set point	620 W
		Delay time	200 x 10 ms
	Outputs - Output 3	Monitoring 1	Enabled
		Monitoring 3	Enabled
	Outputs - Output 4	Monitoring 2	Enabled
		Monitoring 4	Enabled

8.3 Example 3 - Direct starter with current transformer

In this example, an 18.5 kW fan motor is to be controlled and monitored. Three 50 A transformers are required for this.

Output 3 should be used as the alarm output for the running motor.

Output 4 should be used as the fault signaling output for motor and thermistor errors.

8.3.1 Hardware configuration

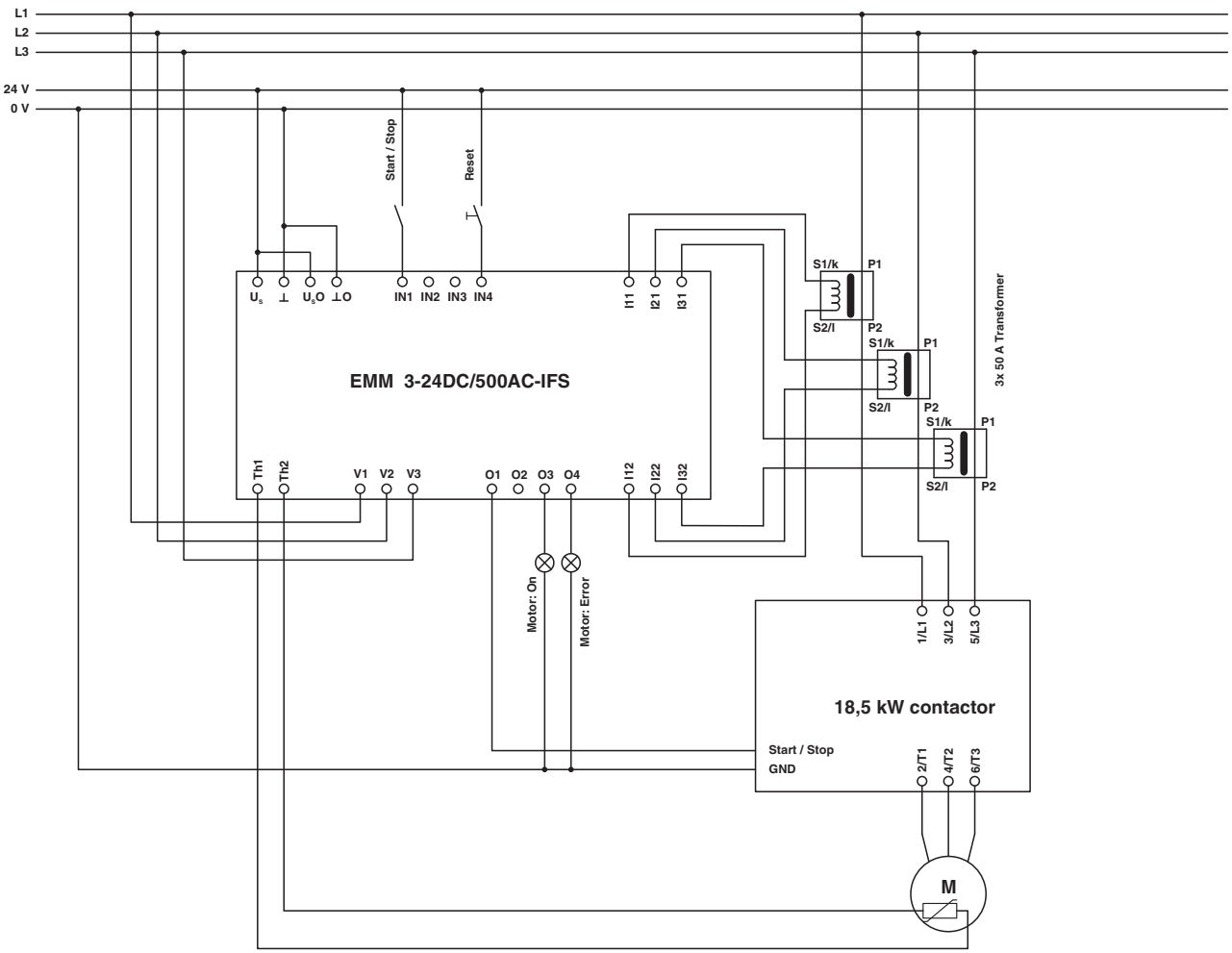


Figure 8-3 Hardware configuration example 3

8.3.2 Software configuration

For this example, the following parameters must be changed in the DTM:

Dialog box	Parameter menu	Parameter	Set value
Configuration	Current transformer	Count	3
		Amplitude transmission factor	10
	Motor output - General Settings	Switching output type	Direct starter
	Motor output - Bimetal	Tripping characteristic curve	10 A
		Cooling-down time	20 minutes
		Manual Reset	1 minute
		Nominal motor current	36 A
		Behavior	Disable drive
		Acknowledgment	Manual
	Motor output - Thermistor	Overtemperature (behavior)	Disable drive
		Overtemperature (acknowledgment)	Manual
		Wire break (behavior)	Disable drive
		Wire break (acknowledgment)	Manual
		Short circuit (behavior)	Disable drive
		Short circuit (acknowledgment)	Manual
	Monitoring - Monitoring 1 Shutdown in the event of underrange, e.g., V-belt monitoring	Activation	During right and left rotation
		Monitoring signal	Effective power : total
		Trigger at	Underrange
		Behavior	Disable drive
		Acknowledgment	Manual
	Monitoring - Monitoring 2 Shutdown in the event of overrange, e.g., filter blocked	Activation	During right and left rotation
		Monitoring signal	Effective power : total
		Trigger at	Overrange
		Behavior	Disable drive
		Acknowledgment	Manual

Dialog box	Parameter menu	Parameter	Set value
Online Parameter	Monitoring - Monitoring 1	Start-up suppression time	100 x 10 ms
		Set point	15000 W
		Delay time	100 x 10 ms
	Monitoring - Monitoring 2	Start-up suppression time	100 x 10 ms
		Set point	19000 W
		Delay time	100 x 10 ms
	Outputs - Output 3	Feedback: Motor right rotation	Enabled
		Feedback: Motor left rotation	Enabled
	Outputs - Output 4	Monitoring 1	Enabled
		Monitoring 2	Enabled
		Thermistor overtemperature	Enabled
		Thermistor short circuit	Enabled
		Thermistor wire break	Enabled

8.4 Example 4 - Reversing starter in potentially explosive areas (ATEX)

In this example, a motor is controlled in an EEx area in right/left mode. In addition to the normal reversing starter, EEx-relevant data must be set here.

8.4.1 Hardware configuration

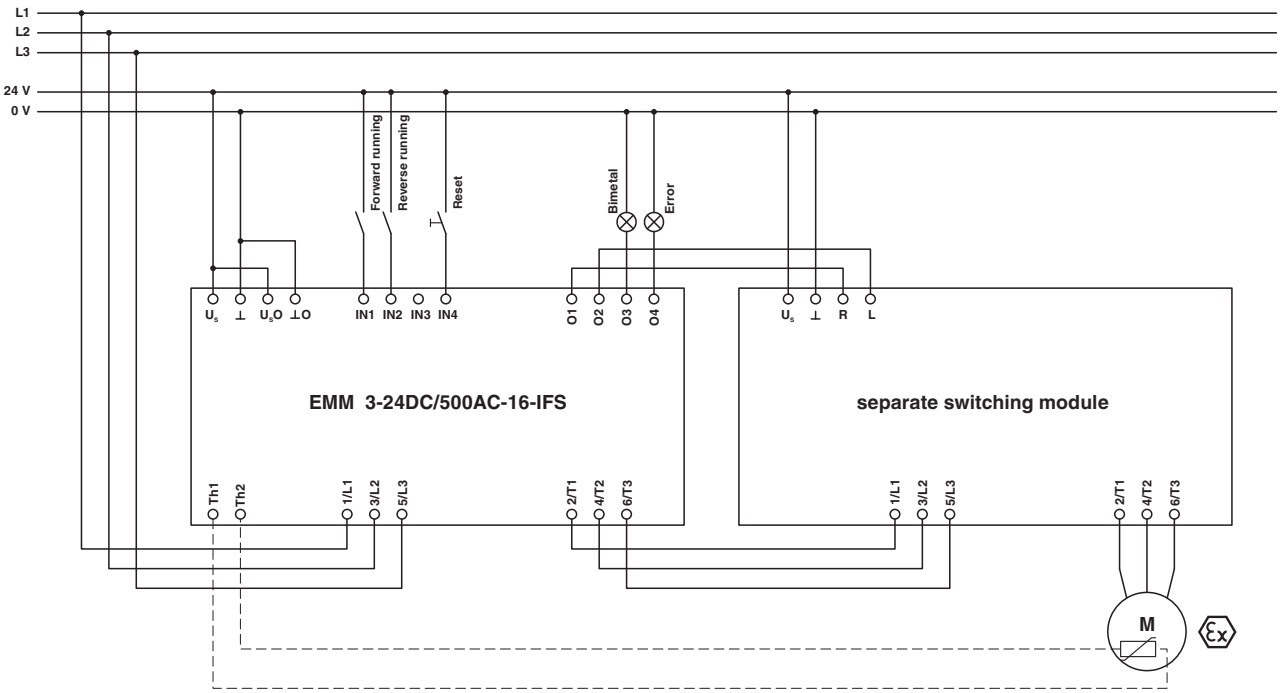


Figure 8-4 Hardware configuration example 4

8.4.2 Software configuration

For this example, the following parameters must be changed in the DTM:

Dialog box	Parameter menu	Parameter	Set value
Configuration	Configuration	Area of application	ATEX
	Motor output - General Settings	Switching output type	Reversing starter
	Motor output - Bimetal	Tripping characteristic curve	10 A
		Cooling-down time	20 minutes
		Manual Reset	1 minute
		Nominal motor current	Refer to motor rating plate for value
		Behavior	Disable drive
		Acknowledgment	Manual
	Motor output - Thermistor (optional)	Overtemperature (behavior)	Disable drive
		Overtemperature (acknowledgment)	Manual
		Wire break (behavior)	Disable drive
		Wire break (acknowledgment)	Manual
		Short circuit (behavior)	Disable drive
		Short circuit (acknowledgment)	Manual
	Monitoring - Monitoring 1 Shutdown in the event of underrange	Activation	During right and left rotation
		Monitoring signal	Effective power : total
		Trigger at	Underrange
		Behavior	Disable drive
		Acknowledgment	Manual
	Monitoring - Monitoring 2 Shutdown in the event of overrange	Activation	During right and left rotation
		Monitoring signal	Effective power : total
		Trigger at	Overrange
		Behavior	Disable drive
		Acknowledgment	Manual

Dialog box	Parameter menu	Parameter	Set value
Online Parameter	Monitoring - Monitoring 1	Start-up suppression time	100 x 10 ms
		Set point	250 W
		Delay time	100 x 10 ms
	Monitoring - Monitoring 2	Start-up suppression time	100 x 10 ms
		Set point	350 W
		Delay time	100 x 10 ms
	Outputs - Output 3	Bimetal monitoring	Enabled
	Outputs - Output 4	Monitoring 1	Enabled
		Monitoring 2	Enabled
		Thermistor overtemperature (optional)	Enabled
		Thermistor wire break (optional)	Enabled
		Thermistor short circuit (optional)	Enabled

8.5 Example 5 - Star/delta

Example structure of a star/delta combination.

8.5.1 Hardware configuration

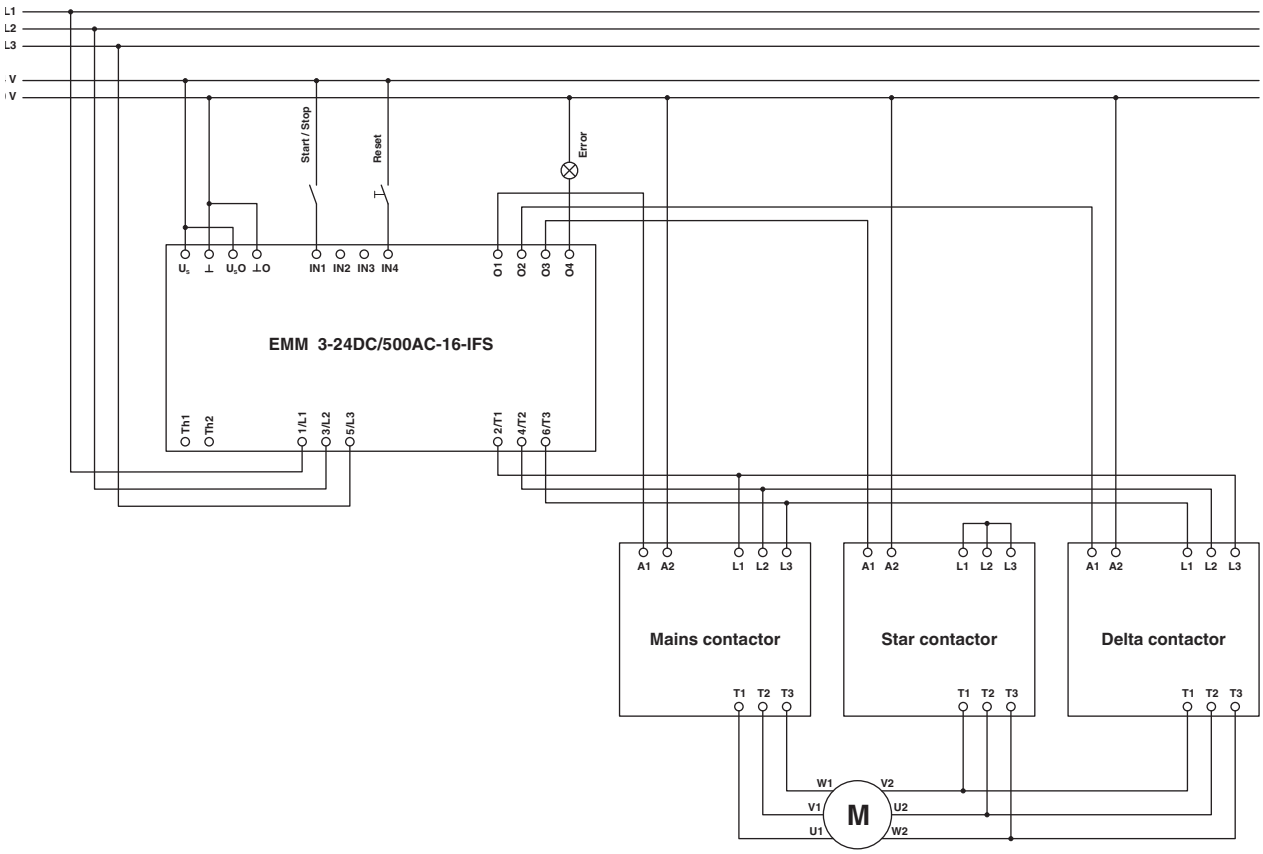


Figure 8-5 Hardware configuration example 5

8.5.2 Software configuration

For this example, the following parameters must be changed in the DTM:

Dialog box	Parameter menu	Parameter	Set value
Configuration	Motor output - General Settings	Switching output type	Star/delta
	Motor output - Bimetal	Tripping characteristic curve	10 A
		Cooling-down time	20 minutes
		Manual Reset	1 minute
		Nominal motor current	Refer to motor rating plate for value
		Behavior	Disable drive
		Acknowledgment	Manual
	Monitoring - Monitoring 1 Shutdown in the event of underrange	Activation	During right and left rotation
		Monitoring signal	Effective power : total
		Trigger at	Overrange
		Behavior	Disable drive
		Acknowledgment	Manual
	Monitoring - Monitoring 2 Shutdown in the event of overrange	Activation	During right and left rotation
		Monitoring signal	Effective power : total
		Trigger at	Overrange
		Behavior	Disable drive
		Acknowledgment	Manual
Online Parameter	Motor output - Star-Delta	Maximal time at star operation	10 x 10 ms
		Change-over delay at changing from star to delta operation	10 x 10 ms
	Monitoring - Monitoring 1	Start-up suppression time	100 x 10 ms
		Set point	250 W
		Delay time	100 x 10 ms
	Monitoring - Monitoring 2	Start-up suppression time	100 x 10 ms
		Set point	350 W
		Delay time	100 x 10 ms
	Outputs - Output 4	Bimetal monitoring	Enabled
		Monitoring 1	Enabled
		Monitoring 2	Enabled

8.6 Example 6 - Star/delta LR

Example structure of a star/delta combination for right/left rotation.

8.6.1 Hardware configuration

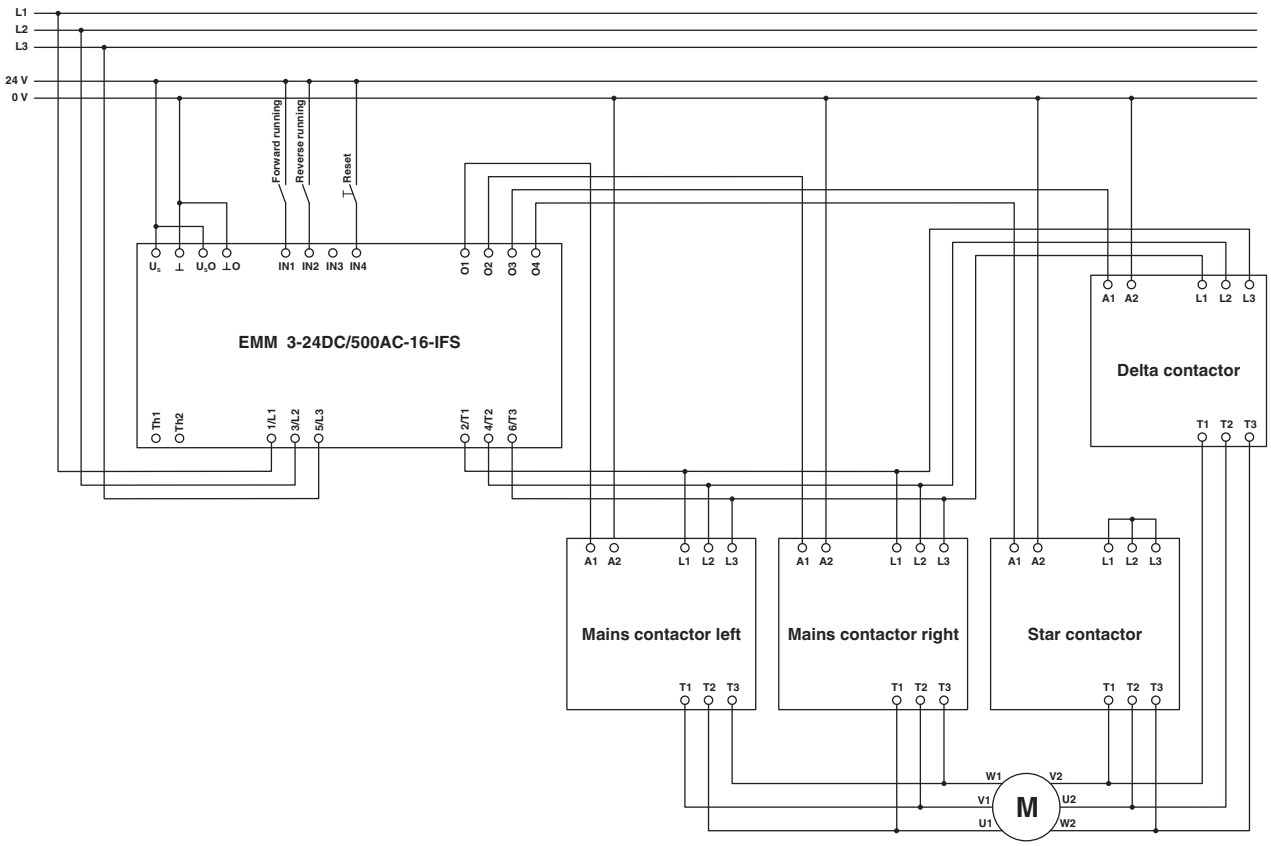


Figure 8-6 Hardware configuration example 6

8.6.2 Software configuration

For this example, the following parameters must be changed in the DTM:

Dialog box	Parameter menu	Parameter	Set value
Configuration	Motor output - General Settings	Switching output type	Star/delta LR
	Motor output - Bimetal	Tripping characteristic curve	10 A
		Cooling-down time	20 minutes
		Manual Reset	1 minute
		Nominal motor current	Refer to motor rating plate for value
		Behavior	Disable drive
		Acknowledgment	Manual
	Monitoring - Monitoring 1 Shutdown in the event of underrange	Activation	During right and left rotation
		Monitoring signal	Effective power : total
		Trigger at	Overrange
		Behavior	Disable drive
		Acknowledgment	Manual
	Monitoring - Monitoring 2 Shutdown in the event of overrange	Activation	During right and left rotation
		Monitoring signal	Effective power: total
		Trigger at	Overrange
		Behavior	Disable drive
		Acknowledgment	Manual
Online Parameter	Motor output - Star-Delta	Maximal time at star operation	10 x 10 ms
		Change-over delay at changing from star to delta operation	10 x 10 ms
	Monitoring - Monitoring 1	Start-up suppression time	100 x 10 ms
		Set point	250 W
		Delay time	100 x 10 ms
	Monitoring - Monitoring 2	Start-up suppression time	100 x 10 ms
		Set point	350 W
		Delay time	100 x 10 ms

8.7 Example 7 - Reversing starter with connection to PROFIBUS

The EM-PB-GATEWAY-IFS is required in order to connect the EMM module to PROFIBUS. It is connected to the bottom of both modules using the TBUS connection.

For information about integrating the EM-PB-GATEWAY-IFS in PROFIBUS and Step7, please refer to "Integration in STEP 7" on page 4-28.

8.7.1 Hardware configuration

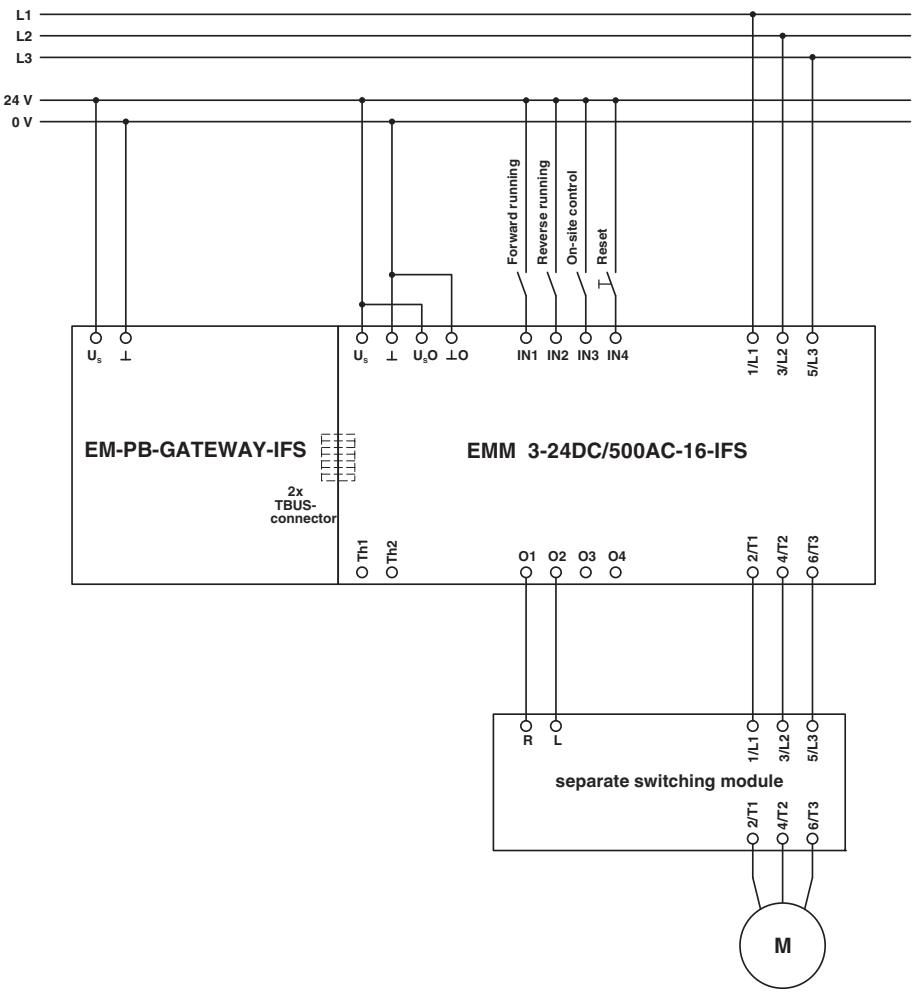


Figure 8-7 Hardware configuration example 7

8.7.2 Software configuration

For this example, the following parameters must be changed in the DTM:

Dialog box	Parameter menu	Parameter	Set value
Configuration	Motor output - General Settings	Switching output type	Reversing starter
	Motor output - Bimetal	Tripping characteristic curve	10 A
		Cooling-down time	20 minutes
		Manual Reset	1 minute
		Nominal motor current	Refer to motor rating plate
		Behavior	Disable drive
		Acknowledgment	Manual
	Monitoring - Monitoring 1 Shutdown in the event of underrange	Activation	During right and left rotation
		Monitoring signal	Effective power : total
		Trigger at	Underrange
		Behavior	Disable drive
		Acknowledgment	Manual
	Monitoring - Monitoring 2 Shutdown in the event of overrange	Activation	During right and left rotation
		Monitoring signal	Effective power : total
		Trigger at	Overrange
		Behavior	Disable drive
		Acknowledgment	Manual
Online Parameter	Monitoring - Monitoring 1	Start-up suppression time	100 x 10 ms
		Set point	350 W
		Delay time	100 x 10 ms
	Monitoring - Monitoring 2	Start-up suppression time	100 x 10 ms
		Set point	350 W
		Delay time	100 x 10 ms
	Outputs - Output 3	Feedback: Motor right rotation	Enabled
		Feedback: Motor left rotation	Enabled
	Outputs - Output 4	Monitoring 1	Enabled
		Monitoring 2	Enabled
		Thermistor overtemperature	Enabled
		Thermistor short circuit	Enabled
		Thermistor wire break	Enabled

8.8 Example 8 - 690 V reversing starter with voltage transducer

To monitor 690 V networks, use the voltage transducer (UT 4-MTDR/ CVC 690/SET, Order No. 2901667).

8.8.1 Hardware configuration

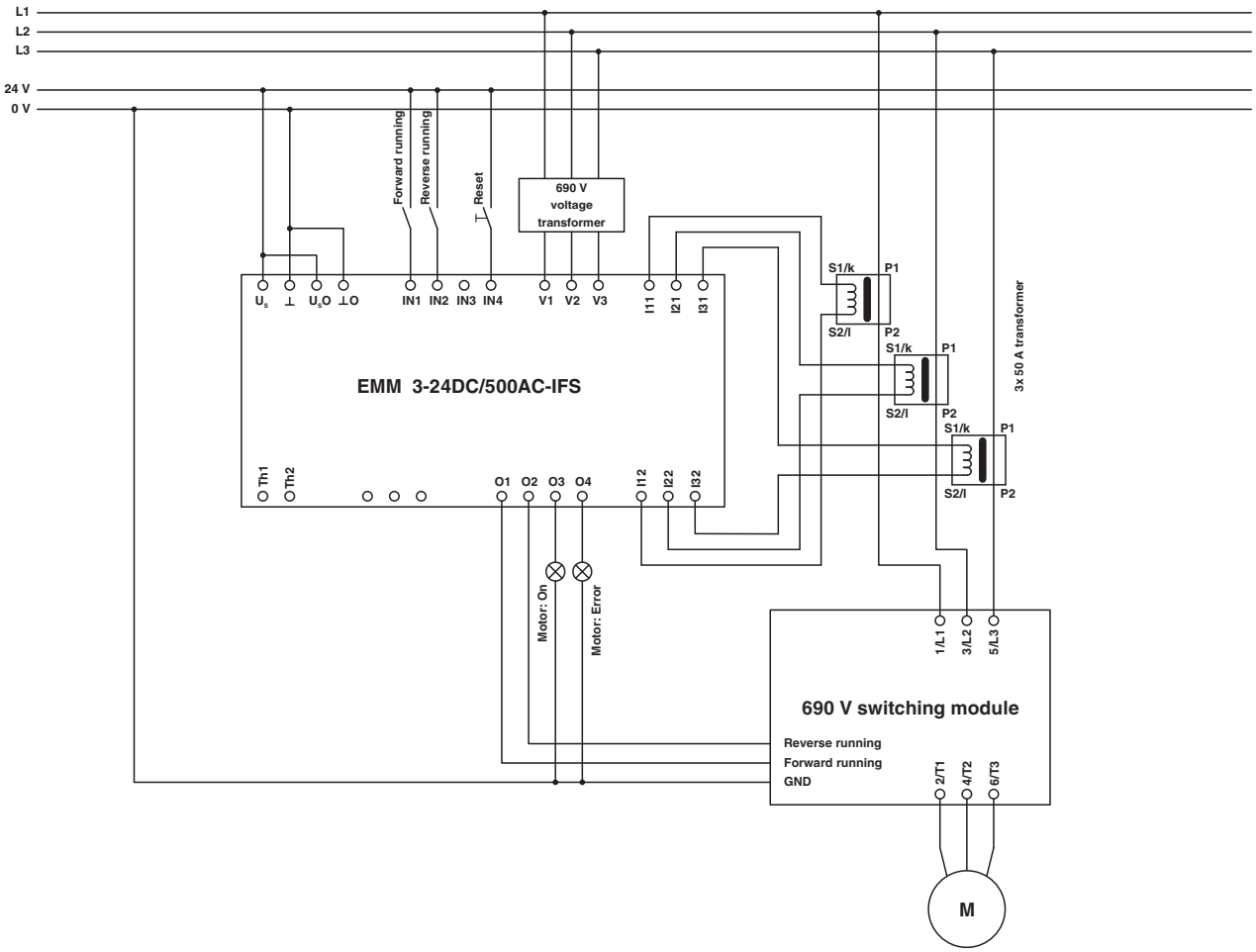


Figure 8-8 Hardware configuration example 8

8.8.2 Software configuration

For this example, the following parameters must be changed in the DTM:

Dialog box	Parameter menu	Parameter	Set value
Configuration	Voltage transformer	Voltage transformer	690 V AC
	Current transformer	Count	3
		Amplitude transmission factor	10
	Motor output - General Settings	Switching output type	Reversing starter
	Motor output - Bimetal	Tripping characteristic curve	10 A
		Cooling-down time	20 minutes
		Manual Reset	1 minute
		Nominal motor current	Refer to motor rating plate for value
		Behavior	Disable drive
		Acknowledgment	Manual
	Monitoring - Monitoring 1 Shutdown in the event of underrange	Activation	During right and left rotation
		Monitoring signal	Effective power : total
		Trigger at	Underrange
		Behavior	Disable drive
		Acknowledgment	Manual
	Monitoring - Monitoring 2 Shutdown in the event of overrange	Activation	During right and left rotation
		Monitoring signal	Effective power : total
		Trigger at	Overrange
		Behavior	Disable drive
		Acknowledgment	Manual

Dialog box	Parameter menu	Parameter	Set value
Online Parameter	Monitoring - Monitoring 1	Start-up suppression time	100 x 10 ms
		Set point	350 W
		Delay time	100 x 10 ms
	Monitoring - Monitoring 2	Start-up suppression time	100 x 10 ms
		Set point	350 W
		Delay time	100 x 10 ms
	Outputs - Output 3	Feedback: Motor right rotation	Enabled
		Feedback: Motor left rotation	Enabled
	Outputs - Output 4	Monitoring 1	Enabled
		Monitoring 2	Enabled
		Thermistor overtemperature	Enabled
		Thermistor short circuit	Enabled
		Thermistor wire break	Enabled